962 Main Street
Jay, ME 04239
Ph : 207-645-5109

Submittal

Job: 1606
Mixed Use York St HVAC
York Street Mixed Use
101 York Street
Portland, ME 04101

Spec Section No: M3.01 HVAC
Submittal No: 2
Revision No: 0
Sent Date: 9/13/2016
Due Date: 9/27/2016

Spec Section Title:

Submittal Title: Roof Top Units

Contractor:
Ranor Mechanical
Aaron St. Pierre

Contractor's Stamp

General Contractor:
Opechee Construction

Architect's Stamp

Engineer's Stamp

Submittal Information Form

Specifications Dated: Scope of Work Narrative dated 6/7/16

Drawings Dated (if applicable): Issued for bid 5/27/16

1 Project: York Street - Mixed Used Development

2 Specification Title: Scope of Work - HVAC

3 Description:

4 Section:

5 Page/Sheet #:

6 Article/Paragraph:

7 Basis of Design: ☑ Yes ☐ No (if no please fill out 8-12)

8 Proposed Substitution:

9 Manufacturer:

10 Trade Name:

11 Model #:

12 Please list SPECIFICALLY the deviations from the basis of design:
See notes on cover page of submittal

13 Equipment Lead Time (after approved submittals) 4-6 weeks

Submittal

Trane U.S. Inc.

Engineer: Mechanical Systems

Date: September 08, 2016

Prepared For:
Ranor Mechanical
PO Box 5036
North Jay, ME 04262 U.S.A.

Job Name:
York Street

Customer P.O. Number:
1606-0002

Trane Job Number:
A224842

Trane is pleased to provide the enclosed submittal for your review and approval.

Qty	Product	Tag(s)
3	Trane Precedent Packaged Gas/Electric Rooftops	HVAC-2, HVAC-4, HVAC-6
3	Trane Foundation 15 Ton Packaged Gas/Electric Rooftops	HVAC-1, HVAC-3, HVAC-5

Please note:

- Based on drawings dated May 27, 2016 – issued for bid
- Based on Scope of Work narrative dated June 7, 2016
- Narrative states duct smoke detectors to be provided by fire alarm subcontractor and Mechanical drawing M3.01 references return air smoke detector in the rooftop schedule. Currently Trane is providing Air Products model SL-2000-P Series smoke detectors for field installation by others. No remote accessories for smoke detectors provided. Can issue a deduct if smoke detectors are provided by others
- Barometric relief shipped loose for field installation by contractor on horizontal return air ductwork.
- Providing knockdown uninsulated, non-seismic, non-isolated roof curbs
- Rooftops ship as downflow configuration and are to be field converted to horizontal configuration
- 1 year parts and labor warranty provided on entire unit. 5 year compressor & heat exchanger (parts only) warranty.
- Not included: disconnect, convenience outlet, thermostat, factory start-up, factory 2-year service/maintenance agreement

The attached information describes the equipment we propose to furnish for this project, and is submitted for your approval.

Jeff Charette
Trane U.S. Inc. dba Trane
860 Spring Street, Unit 1
Westbrook, ME 04092
Phone: (207) 239-3401
Fax: (207) 828-1511

Table Of Contents

Tag Data – Trane Precedent Packaged Gas/Electric Rooftop (Qty: 3)

Item	Tag(s)	Qty	Description	Model Number
A1	HVAC-2, HVAC-6	2	4 Ton Packaged Gas/Electric RTU	YSC048G3EMA--C001C00002A0000000000000000
A2	HVAC-4	1	5 Ton Packaged Gas/Electric RTU	YSC060G3EMA--C001C00002A0000000000000000

Product Data - Trane Precedent Packaged Gas/Electric Rooftop Units

Trane Packaged gas/electric rooftop – R410a DX cooling, natural gas heat
Standard efficiency – 12.0 EER / 14.0 SEER
Convertible configuration – ships as downflow and field convert to horizontal
208-230/60/3
Electro mechanical controls
Medium gas heat
0-100%Economizer w/ Dry Bulb control
Microchannel condenser coil w/hail guard
Through the base gas & electrical
Crankcase heater
Return air smoke detector
Standard 14” tall knockdown uninsulated, non-isolated, non-seismic flat Roof curb (Fld)
Barometric relief (Fld)
1 Year Parts & Labor warranty on entire unit
5 Year compressor & heat exchanger warranty – parts only

Item: A1 Qty: 2 Tag(s): HVAC-2, HVAC-6

4 Ton

Item: A2 Qty: 1 Tag(s): HVAC-4

5 Ton

Performance Data - Trane Precedent Packaged Gas/Electric Rooftop Units

Tags	HVAC-2, HVAC-6	HVAC-4
Design Airflow (cfm)	1600	2000
Airflow Application	Horizontal	Horizontal
Cooling Entering DB (F)	80.00	80.00
Cooling Entering WB (F)	67.00	67.00
Ambient Temp (F)	95.00	95.00
Evap Coil Leaving Air Temp (DB) (F)	61.10	64.60
Evap Coil Leaving Air Temp (WB) (F)	60.53	61.83
Cooling Leaving Unit DB (F)	59.10	59.10
Cooling Leaving Unit WB (F)	57.75	58.10
Gross Total Capacity (MBh)	48.22	59.96
Gross Sensible Capacity (MBh)	38.24	49.25
Gross Latent Capacity (MBh)	9.98	10.71
Net Total Capacity (MBh)	46.17	58.23
Net Sensible Capacity (MBh)	36.19	47.52
Net Sensible Heat Ratio (Number)	0.78	0.82
Heating EAT (F)	60.00	60.00
Heating LAT (F)	98.20	90.70
Heating Delta T (F)	38.20	30.70
Input Heating Capacity (MBh)	80.00	80.00
Output Heating Capacity (MBh)	65.60	65.60
Output Heating Cap. w/Fan (MBh)	68.16	68.59
Design ESP (in H2O)	0.900	0.900
Component SP (in H2O)	0.130	0.180
Indoor mtr operating power (bhp)	0.84	0.99
Indoor RPM (rpm)	1173	1148
Indoor Motor Power (kW)	0.63	0.74
Compressor Power (kW)	3.38	3.94
System Power (kW)	4.67	4.83
IPLV @ AHRI (IPLV)	0.0	0.0
MCA (A)	25.40	28.30
MOP (A)	35.00	40.00
Compressor 1 RLA (A)	13.70	15.90
Compressor 2 RLA (A)	0.00	0.00
Evaporator fan FLA (A)	6.90	6.90
Condenser fan FLA (A)	1.40	1.40
Evaporator face area (sq ft)	6.98	6.98
Evaporator rows (Each)	2.00	2.00
Evaporator fin spacing (Per Foot)	192	192
Evaporator face velocity (ft/min)	229	287
Min. unit operating weight (lb)	492.0	522.0
Max. unit operating weight (lb)	767.0	797.0
Fan motor heat (MBh)	2.05	1.73
Dew Point (F)	56.90	57.49
Max Available ESP (in H2O)	1.330	1.070
Ducted Discharge Heating - 63 Hz (dB)	90	92
Ducted Discharge Heating - 125 Hz (dB)	74	81
Ducted Discharge Heating - 250 Hz (dB)	69	76
Ducted Discharge Heating - 500 Hz (dB)	60	67
Ducted Discharge Heating - 1 kHz (dB)	58	64
Ducted Discharge Heating - 2 kHz (dB)	54	60
Ducted Discharge Heating - 4 kHz (dB)	52	57
Ducted Discharge Heating - 8 kHz (dB)	46	51
Ducted Inlet Heating - 63 Hz (dB)	91	92
Ducted Inlet Heating - 125 Hz (dB)	70	76

Tags	**HVAC-2, HVAC-6**	**HVAC-4**
Ducted Inlet Heating - 250 Hz (dB)	65	68
Ducted Inlet Heating - 500 Hz (dB)	56	60
Ducted Inlet Heating - 1 kHz (dB)	52	55
Ducted Inlet Heating - 2 kHz (dB)	50	54
Ducted Inlet Heating - 4 kHz (dB)	47	52
Ducted Inlet Heating - 8 kHz (dB)	42	46
Outdoor Noise Heating - 63 Hz (dB)	81	85
Outdoor Noise Heating - 125 Hz (dB)	82	82
Outdoor Noise Heating - 250 Hz (dB)	83	81
Outdoor Noise Heating - 500 Hz (dB)	81	81
Outdoor Noise Heating - 1 kHz (dB)	77	77
Outdoor Noise Heating - 2 kHz (dB)	72	72
Outdoor Noise Heating - 4 kHz (dB)	66	67
Outdoor Noise Heating - 8 kHz (dB)	59	61
Refrig charge (HFC-410A) - ckt 1 (lb)	3.1	4.4
Saturated Suction Temp Circuit 1 (F)	49.83	50.43
Saturated Discharge Temp Circuit 1 (F)	116.67	117.07
EER @ AHRI Conditions (EER)	14.0	14.0
Total Static Pressure (in H2O)	1.030	1.070

TRANE

Direct Drive - Evaporator Fan Performance

Table 35. Multispeed direct drive evaporator fan performance 3 to 5 tons - standard efficiency - low & medium gas heat YSC033/036G3,4,W, YSC043/048G3,4,W, YSC060/063G3,4,W

Tons	Unit Model Number	cfm	External Static Pressure (Inches of Water) & Motor Power (bhp)[a]														
			Speed Set 1			Speed Set 2			Speed Set 3			Speed Set 4			Speed Set 5		
			ESP	rpm	bhp	ESP	rpm	bhp	ESP	rpm	bhp	ESP	rpm	bhp	ESP	rpm	bhp
3	YSC(033, 036)G3,4,W Downflow Airflow	960	0.39	689	0.175	0.72	853	0.29	1.10	998	0.43	1.53	1136	0.61	—	—	—
		1020	0.32	663	0.169	0.64	832	0.28	1.02	978	0.42	1.43	1117	0.60	—	—	—
		1080	0.25	637	0.162	0.56	811	0.28	0.93	958	0.42	1.34	1099	0.59	—	—	—
		1140	0.18	612	0.156	0.48	790	0.27	0.84	938	0.41	1.24	1080	0.58	—	—	—
		1200	0.11	586	0.149	0.40	769	0.26	0.75	918	0.40	1.15	1061	0.57	1.47	1162	0.71
		1260	0.04	561	0.143	0.32	748	0.25	0.67	898	0.39	1.05	1043	0.56	1.39	1143	0.69
		1320	—	—	—	0.25	726	0.25	0.58	878	0.38	0.96	1024	0.55	1.30	1123	0.68
		1380	—	—	—	0.17	705	0.24	0.49	858	0.37	0.86	1005	0.54	1.22	1104	0.67
		1440	—	—	—	0.09	684	0.23	0.41	838	0.36	0.77	987	0.53	1.13	1084	0.66
3	YSC(033, 036)G3,4,W Horizontal Airflow	960	0.42	681	0.174	0.70	839	0.29	1.05	982	0.43	1.42	1099	0.59	—	—	—
		1020	0.35	656	0.167	0.63	816	0.28	0.97	961	0.42	1.34	1080	0.58	—	—	—
		1080	0.28	630	0.161	0.56	793	0.27	0.90	940	0.41	1.25	1061	0.57	—	—	—
		1140	0.22	605	0.154	0.49	770	0.26	0.82	919	0.40	1.17	1042	0.56	1.46	1152	0.70
		1200	0.15	579	0.148	0.43	747	0.25	0.75	898	0.39	1.09	1023	0.55	1.39	1135	0.69
		1260	0.08	554	0.141	0.36	724	0.25	0.68	877	0.38	1.01	1005	0.54	1.33	1117	0.68
		1320	0.01	528	0.135	0.29	701	0.24	0.60	856	0.37	0.93	986	0.53	1.26	1100	0.67
		1380	—	—	—	0.22	678	0.23	0.53	835	0.36	0.85	967	0.52	1.19	1083	0.66
		1440	—	—	—	0.16	655	0.22	0.45	814	0.35	0.77	948	0.51	1.12	1066	0.65
4	YSC(043, 048)G3,4,W Downflow Airflow	1280	0.67	887	0.36	0.84	994	0.46	—	—	—	—	—	—	—	—	—
		1360	0.55	854	0.34	0.70	959	0.45	0.94	1049	0.56	1.17	1133	0.68	—	—	—
		1440	0.44	821	0.33	0.57	924	0.43	0.80	1015	0.54	1.02	1098	0.66	—	—	—
		1520	0.32	788	0.32	0.44	889	0.41	0.65	980	0.52	0.87	1063	0.64	1.47	1210	0.87
		1600	0.20	755	0.30	0.30	854	0.40	0.51	945	0.50	0.72	1028	0.61	1.32	1181	0.84
		1680	0.08	722	0.29	0.17	819	0.38	0.37	910	0.48	0.57	993	0.59	1.17	1151	0.82
		1760	—	—	—	0.03	783	0.37	0.23	876	0.47	0.42	958	0.57	1.03	1121	0.80
		1840	—	—	—	—	—	—	0.08	841	0.45	0.28	923	0.55	0.88	1092	0.78
		1920	—	—	—	—	—	—	—	—	—	0.13	888	0.53	0.73	1062	0.76
4	YSC(043, 048)G3,4,W Horizontal Airflow	1280	0.69	872	0.35	0.83	934	0.44	—	—	—	—	—	—	—	—	—
		1360	0.58	839	0.34	0.72	902	0.42	0.91	980	0.52	1.09	1057	0.63	—	—	—
		1440	0.47	806	0.32	0.62	869	0.41	0.80	948	0.50	0.97	1026	0.61	—	—	—
		1520	0.35	773	0.31	0.51	837	0.39	0.69	915	0.49	0.86	994	0.59	1.47	1204	0.86
		1600	0.24	739	0.30	0.40	804	0.38	0.58	883	0.47	0.74	962	0.57	1.33	1173	0.84
		1680	0.13	706	0.28	0.30	772	0.36	0.47	851	0.45	0.62	931	0.56	1.20	1142	0.82
		1760	0.02	673	0.27	0.19	739	0.34	0.36	819	0.44	0.51	899	0.54	1.06	1112	0.80
		1840	—	—	—	0.09	707	0.33	0.25	787	0.42	0.39	868	0.52	0.93	1081	0.77
		1920	—	—	—	—	—	—	0.13	755	0.40	0.28	836	0.50	0.79	1051	0.75
5	YSC(063, 060)G3,4,W Downflow Airflow	1600	0.79	998	0.58	1.07	1083	0.69	1.31	1183	0.83	—	—	—	—	—	—
		1700	0.62	956	0.55	0.92	1043	0.67	1.12	1144	0.80	1.21	1179	0.89	—	—	—
		1800	0.45	913	0.53	0.77	1004	0.64	0.93	1105	0.77	1.01	1136	0.86	—	—	—
		1900	0.28	870	0.50	0.62	964	0.62	0.74	1066	0.75	0.82	1094	0.83	1.23	1188	1.02
		2000	0.11	828	0.48	0.47	924	0.59	0.54	1027	0.72	0.62	1052	0.80	1.03	1150	0.99
		2100	—	—	—	0.32	885	0.57	0.35	987	0.69	0.43	1009	0.76	0.82	1111	0.96
		2200	—	—	—	0.17	845	0.54	0.16	948	0.66	0.23	967	0.73	0.61	1073	0.93
		2300	—	—	—	0.02	805	0.52	—	—	—	0.04	924	0.70	0.40	1035	0.89
		2400	—	—	—	—	—	—	—	—	—	—	—	—	0.20	997	0.86
5	YSC(063, 060)G3,4,W Horizontal Airflow	1600	0.84	989	0.57	0.97	1049	0.67	1.16	1144	0.80	1.32	1159	0.88	—	—	—
		1700	0.68	945	0.55	0.82	1008	0.65	1.00	1104	0.77	1.16	1119	0.85	—	—	—
		1800	0.52	901	0.52	0.66	966	0.62	0.84	1064	0.74	1.00	1079	0.82	—	—	—
		1900	0.36	857	0.49	0.51	924	0.59	0.68	1024	0.72	0.84	1039	0.79	1.26	1189	1.03
		2000	0.20	813	0.47	0.36	882	0.57	0.52	984	0.69	0.67	999	0.76	1.07	1148	0.99
		2100	0.04	769	0.44	0.21	840	0.54	0.36	944	0.66	0.51	959	0.73	0.89	1106	0.95
		2200	—	—	—	0.05	799	0.51	0.20	904	0.63	0.35	918	0.70	0.70	1065	0.92
		2300	—	—	—	—	—	—	0.04	864	0.60	0.19	878	0.67	0.52	1023	0.88
		2400	—	—	—	—	—	—	—	—	—	0.03	838	0.64	0.33	982	0.85

For 036 models, fan motor heat (MBh) = 2.72 x Fan Bhp + 0.16. For 048 & 060 models, fan motor heat (MBh) = 2.87 x Fan Bhp + 0.15.
Factory supplied motors, in commercial equipment, are definite purpose motors, specifically designed and tested to operate reliably and continuously at all cataloged conditions. Using the full horsepower range of our fan motors as shown in our tabular data will not result in nuisance tripping or premature motor failure. Our product's warranty will not be affected.

(a) Data includes pressure drop due to wet coil and filters.

Mechanical Specifications - Trane Precedent Packaged Gas/Electric Rooftop Units
Item: A1, A2 Qty: 3 Tag(s): HVAC-2, HVAC-6, HVAC-4

General
The units shall be convertible airflow. The operating range shall be between 115°F and 0°F in cooling as standard from the factory for units with microprocessor controls. Operating range for units with electromechanical controls shall be between 115°F and 40°F. Cooling performance shall be rated in accordance with ARI testing procedures. All units shall be factory assembled, internally wired, fully charged with R-410A, and 100 percent run tested to check cooling operation, fan and blower rotation, and control sequence before leaving the factory. Wiring internal to the unit shall be colored and numbered for simplified identification. Units shall be cULus listed and labeled, classified in accordance for Central Cooling Air Conditioners.

Casing
Unit casing shall be constructed of zinc coated, heavy gauge, galvanized steel. Exterior surfaces shall be cleaned, phosphatized, and finished with a weather-resistant baked enamel finish. Unit's surface shall be tested 672 hours in a salt spray test in compliance with ASTM B117. Cabinet construction shall allow for all maintenance on one side of the unit. Service panels shall have lifting handles and be removed and reinstalled by removing two fasteners while providing a water and air tight seal. All exposed vertical panels and top covers in the indoor air section shall be insulated with a cleanable foil-faced, fire-retardant permanent, odorless glass fiber material. The base of the unit shall be insulated with 1/8 inch, foil-faced, closed-cell insulation. All insulation edges shall be either captured or sealed. The unit's base pan shall have no penetrations within the perimeter of the curb other than the raised 1 1/8 inch high downflow supply/return openings to provide an added water integrity precaution, if the condensate drain backs up. The base of the unit shall have provisions for forklift and crane lifting, with forklift capabilities on three sides of the unit.

Unit Top
The top cover shall be one piece construction or, where seams exist, it shall be double-hemmed and gasket-sealed. The ribbed top adds extra strength and enhances water removal from unit top.

Filters
Throwaway filters shall be standard on all units. Optional 2-inch MERV 8 and MERV 13 filters shall also be available.

Compressors
All units shall have direct-drive, hermetic, scroll type compressors with centrifugal type oil pumps. Motor shall be suction gas-cooled and shall have a voltage utilization range of plus or minus 10 percent of unit nameplate voltage. Internal overloads shall be provided with the scroll compressors.

Dual compressors are outstanding for humidity control, light load cooling conditions and system back-up applications. Dual compressors are available on 7½-10 ton models and allow for efficient cooling utilizing 3-stages of compressor operation for all high efficiency models.

Notes:
Crankcase heaters are optional on YSC (036, 048, 060, 072, 090, 102, 120); standard on YHC (036, 048, 060, 072, 092, 102, 120).

Indoor Fan
The following units shall be equipped with a direct drive plenum fan design (T/YSC120F,T/YHC074F, T/YHC092F,T/YHC102F, 120F). Plenum fan design shall include a backward-curved fan wheel along with an external rotor direct drive variable speed indoor motor. All plenum fan designs will have a variable speed adjustment potentiometer located in the control box.

3 to 5 ton units (high efficiency 3-phase with optional motor) are belt driven, FC centrifugal fans with adjustable motor sheaves. 3 to 5 ton units (standard and high efficiency 3-phase) have multispeed, direct drive motors. All 6 to 8½ ton units (standard efficiency) shall have belt drive motors with an adjustable idler-arm assembly for quick-adjustment to fan belts and motor sheaves. All motors shall be thermally protected. All 10 tons, 6 ton (074), 7½ to 8½ (high efficiency) units have variable speed direct drive motors. All indoor fan motors meet the U.S. Energy Policy Act of 1992 (EPACT).

Outdoor Fans
The outdoor fan shall be direct-drive, statically and dynamically balanced, draw-through in the vertical discharge position. The fan motor shall be permanently lubricated and shall have built-in thermal overload protection.

Evaporator and Condenser Coils
Internally finned, 5/16" copper tubes mechanically bonded to a configured aluminum plate fin shall be standard. Evaporator coils are standard for all 3 to 10 ton standard efficiency models. Microchannel condenser coils are standard

for all 3 to 10 ton standard efficiency models and 4,5,6, 7.5, 8.5 ton high efficiency models.The microchannel type condenser coil is not offered on the 4 and 5 ton dehumidification model. Due to flat streamlined tubes with small ports, and metallurgical tube-to-fin bond, microchannel coil has better heat transfer performance. Microchannel condenser coil can reduce system refrigerant charge by up to 50% because of smaller internal volume, which leads to better compressor reliability. Compact all-aluminum microchannel coils also help to reduce the unit weight.These all aluminum coils are recyclable. Galvanic corrosion is also minimized due to all aluminum construction. Strong aluminum brazed structure provides better fin protection. In addition, flat streamlined tubes also make microchannel coils more dust resistant and easier to clean. Coils shall be leak tested at the factory to ensure the pressure integrity.The evaporator coil and condenser coil shall be leak tested to 600 psig.The assembled unit shall be leak tested to 465 psig.The condenser coil shall have a patent pending 1+1+1 hybrid coil designed with slight gaps for ease of cleaning.A plastic, dual-sloped, removable and reversible condensate drain pan with through-the-base condensate drain is standard.

Tool-less Hail Guards
Tool-less, hail protection quality coil guards are available for condenser coil protection.

Controls
Unit shall be completely factory-wired with necessary controls and contactor pressure lugs or terminal block for power wiring. Unit shall provide an external location for mounting a fused disconnect device. A choice of microprocessor or electromechanical controls shall be available. Microprocessor controls provide for all 24V control functions. The resident control algorithms shall make all heating, cooling, and/or ventilating decisions in response to electronic signals from sensors measuring indoor and outdoor temperatures. The control algorithm maintains accurate temperature control, minimizes drift from set point, and provides better building comfort. A centralized microprocessor shall provide anti-short cycle timing and time delay between compressors to provide a higher level of machine protection. 24-volt electromechanical control circuit shall include control transformer and contactor

High Pressure Control
All units include High Pressure Cutout as standard.

Phase monitor
Phase monitor shall provide 100% protection for motors and compressors against problems caused by phase loss, phase imbalance, and phase reversal. Phase monitor is equipped with an LED that provides an ON or FAULT indicator. There are no field adjustments. The module will automatically reset from a fault condition.

Refrigerant Circuits
Each refrigerant circuit offer thermal expansion valve as standard. Service pressure ports, and refrigerant line filter driers are factory-installed as standard. An area shall be provided for replacement suction line driers.

Gas Heating Section
The heating section shall have a progressive tubular heat exchanger design using stainless steel burners and corrosion resistant steel throughout. An induced draft combustion blower shall be used to pull the combustion products through the firing tubes. The heater shall use a direct spark ignition (DSI) system. On initial call for heat, the combustion blower shall purge the heat exchanger for 20 seconds before ignition After three unsuccessful ignition attempts, the entire heating system shall be locked out until manually reset at the thermostat/zone sensor. Units shall be suitable for use with natural gas or propane (field-installed kit) and also comply with the California requirement for low NOx emissions (Gas/Electric Only).

Economizer
This accessory shall be available with or without barometric relief. The assembly includes fully modulating 0-100 percent motor and dampers, minimum position setting, preset linkage, wiring harness with plug, spring return actuator and fixed dry bulb control. The barometric relief shall provide a pressure operated damper that shall be gravity closing and shall prohibit entrance of outside air during the equipment off cycle. Optional solid state or differential enthalpy control shall be available for either factory or field installation. The economizer arrives in the shipping position and shall be moved to the operating position by the installing contractor.

Through the Base Gas Piping
The unit shall include a standard through the base gas provision. This option shall have all piping necessary including, black steel, manual gas shut-off valve, elbows, and union. The manual shutoff valve shall include a 1/8" NPT pressure tap. This assembly will require minor field labor to install.

Through the Base Electrical Access
An electrical service entrance shall be provided allowing electrical access for both control and main power connections inside the curb and through the base of the unit. Option will allow for field installation of liquid-tight conduit and an

external field-installed disconnect switch.

Return Air Smoke Detector

Smoke detector shall be factory installed photoelectric smoke detector mounted in the return air section (with or without the economizer or motorized damper option). The detector will be wired for continuous power whenever the unit is energized. Upon detection of smoke, the detector will shut down all unit operations. Local codes may dictate the location of detectors. Note: Due to the shipping position of the economizer or motorized damper, the return air smoke detector will not be completely factory installed. The wiring harness for the detector will be routed and tied off in the fan compartment for shipping. The smoke detector and barometric damper hood will also be installed in a shipping position in the fan compartment.

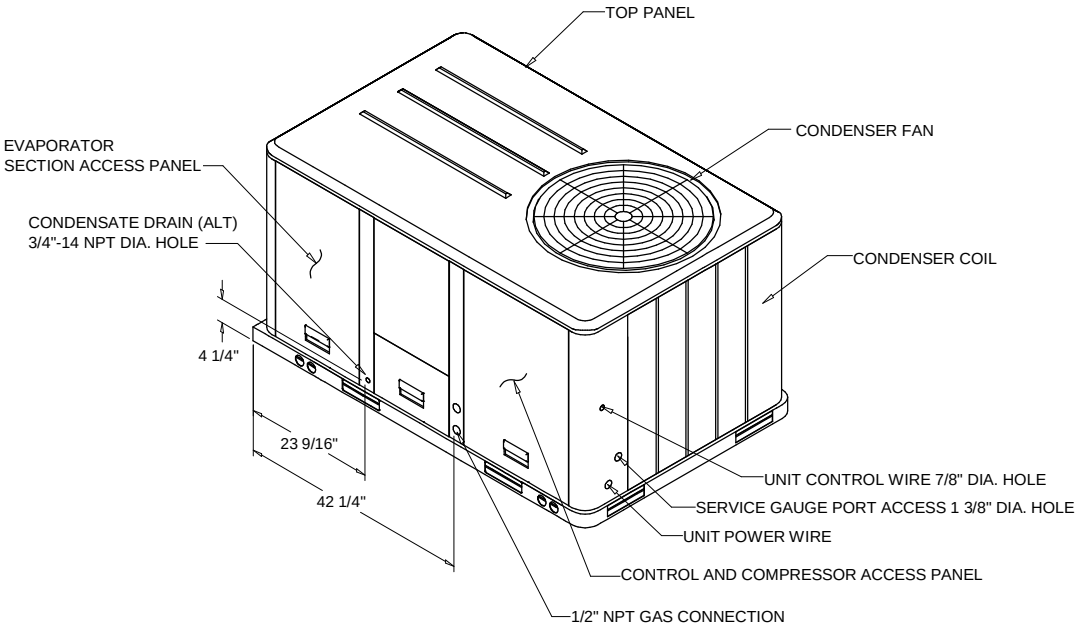
Accessory - Roof Curb

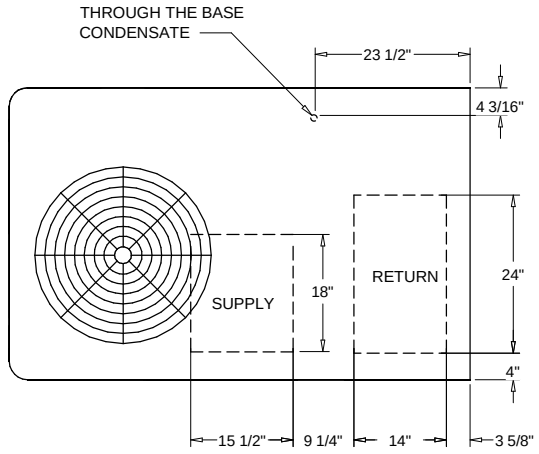
The roof curb shall be designed to mate with the unit's downflow supply and return and provide support and a water tight installation when installed properly. The roof curb design shall allow field fabricated rectangular supply/return ductwork to be connected directly to the curb. Curb design shall comply with NRCA requirements. Curb shall be shipped knocked down for field assembly and shall include wood nailer strips.

Frostat

This option is to be utilized as a safety device.The Frostat opens when temperatures on the evaporator coil fall below 10°F.The temperature will need to rise to 50°F before closing.This feature should be utilized in low airflow or high outside air applications (cooling only).

Unit Dimensions - Trane Precedent Packaged Gas/Electric Rooftop Units
Item: A1, A2 Qty: 3 Tag(s): HVAC-2, HVAC-6, HVAC-4

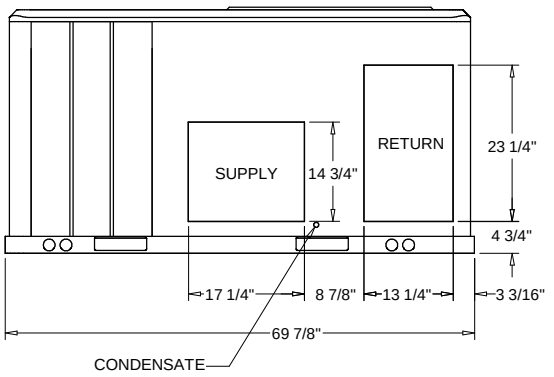


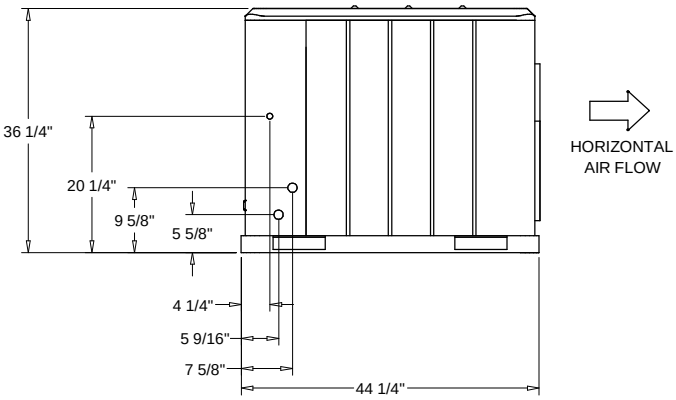


NOTES:
1. THRU -THE -BASE GAS AND ELECTRICAL IS NOT STANDARD ON ALL UNITS.
2. VERIFY WEIGHT, CONNECTION, AND ALL DIMENSION WITH INSTALLER DOCUMENTS BEFORE INSTALLATION

PLAN VIEW UNIT

DIMENSION DRAWING

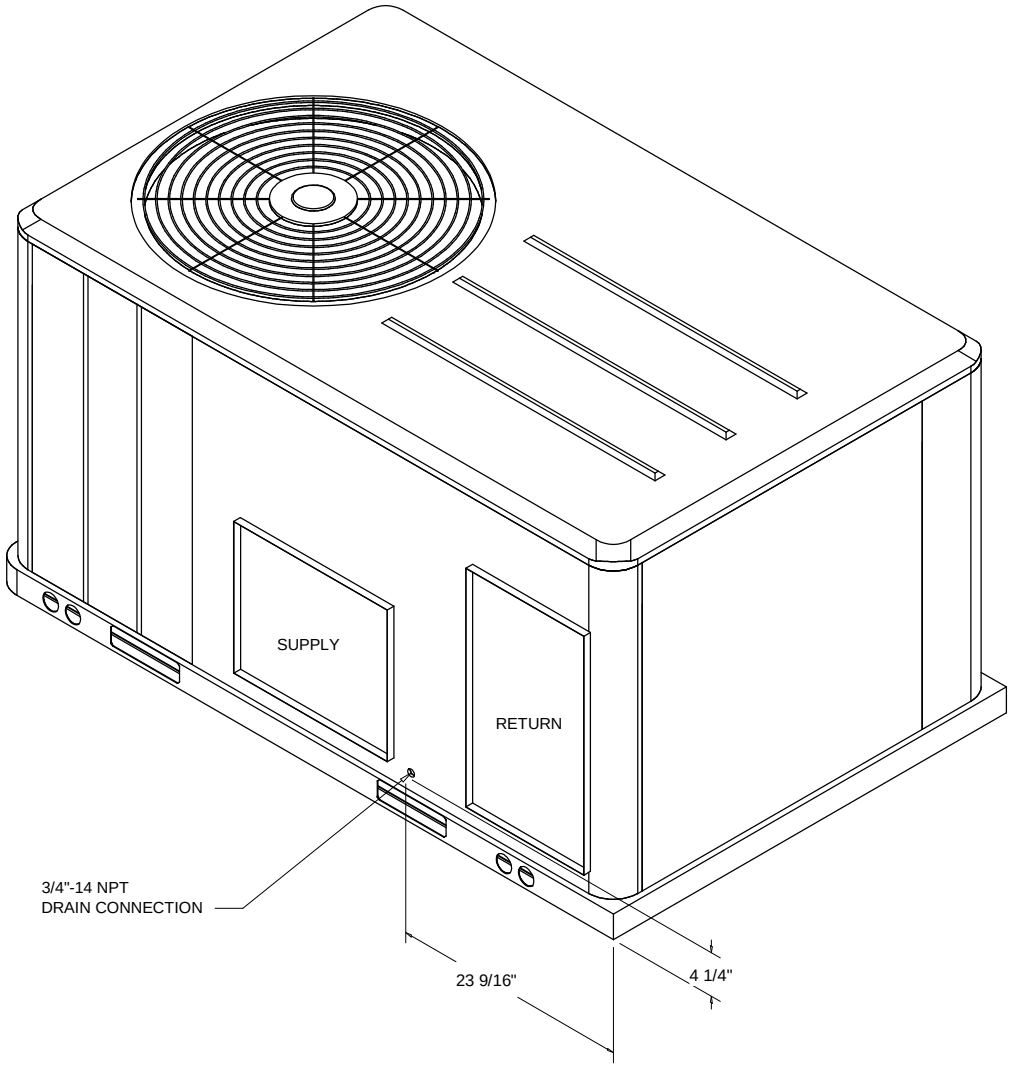




PACKAGED GAS / ELECTRICAL

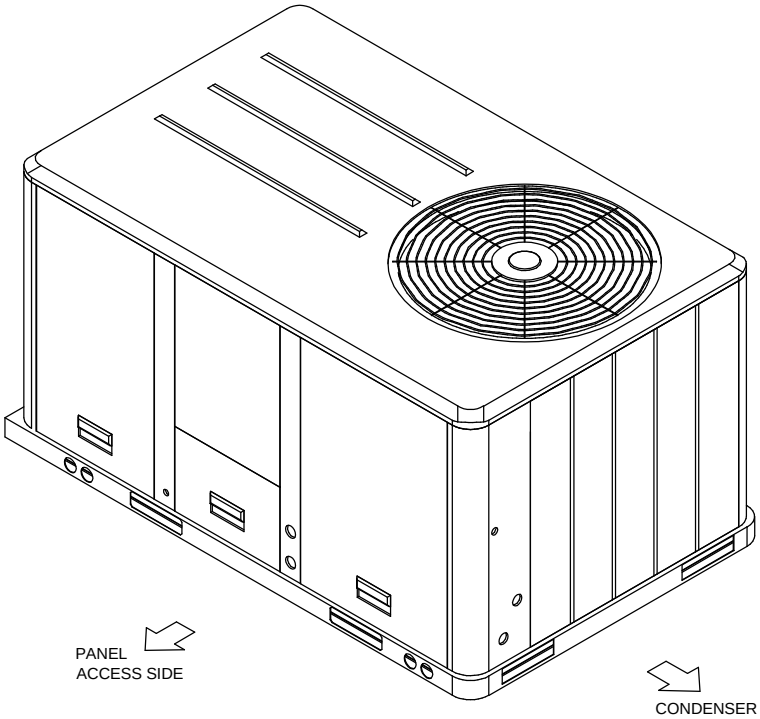
DIMENSION DRAWING

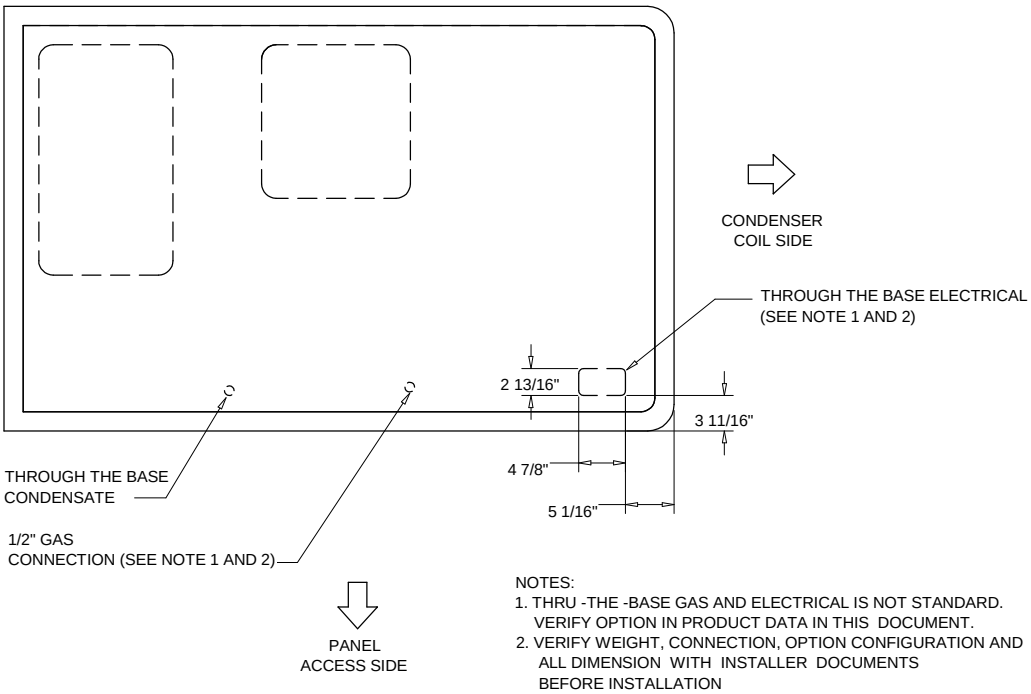
Unit Dimensions - Trane Precedent Packaged Gas/Electric Rooftop Units
Item: A1, A2 Qty: 3 Tag(s): HVAC-2, HVAC-6, HVAC-4



ISOMETRIC-PACKAGED COOLING

Unit Dimensions - Trane Precedent Packaged Gas/Electric Rooftop Units
Item: A1, A2 Qty: 3 Tag(s): HVAC-2, HVAC-6, HVAC-4





NOTES:
1. THRU -THE -BASE GAS AND ELECTRICAL IS NOT STANDARD. VERIFY OPTION IN PRODUCT DATA IN THIS DOCUMENT.
2. VERIFY WEIGHT, CONNECTION, OPTION CONFIGURATION AND ALL DIMENSION WITH INSTALLER DOCUMENTS BEFORE INSTALLATION

THRU THE BASE GAS / ELECTRICAL

PLAN / ISO VIEW DRAWING

Unit Dimensions - Trane Precedent Packaged Gas/Electric Rooftop Units
Item: A1 Qty: 2 Tag(s): HVAC-2, HVAC-6

ELECTRICAL / GENERAL DATA

GENERAL (2)(4)(6)

		Oversized Motor
Model:	YSC048G	
Unit Operating Voltage:	187-253	MCA: N/A
Unit Primary Voltage:	208	MFS: N/A
Unit Secondary Voltage	230	MCB: N/A
Unit Hertz:	60	
Unit Phase:	3	
EER/SEER	12.0/14.0	

Standard Motor		Field Installed Oversized Motor
MCA:	25.4	MCA: N/A
MFS:	35.0	MFS: N/A
MCB:	35.0	MCB: N/A

HEATING PERFORMANCE

HEATING - GENERAL DATA

Heating Model:	Medium
Heating Input (BTU):	80,000
Heating Output (BTU):	65,600
No. Burners:	2
No. Stages	1

Gas Inlet Pressure

Natural Gas (Min/Mix):	4.5/14.0
LP (Min/Max)	11.0/14.0
Gas Pipe Connection Size:	1/2"

INDOOR MOTOR

Standard Motor		Oversized Motor		Field Installed Oversized Motor	
Number:	1	Number:	N/A	Number:	N/A
Horsepower:	1.0	Horsepower:	N/A	Horsepower:	N/A
Motor Speed (RPM):	--	Motor Speed (RPM):	N/A	Motor Speed (RPM):	N/A
Phase	1	Phase	N/A	Phase	N/A
Full Load Amps:	6.9	Full Load Amps:	N/A	Full Load Amps:	N/A
Locked Rotor Amps:	--	Locked Rotor Amps:	N/A	Locked Rotor Amps:	N/A

COMPRESSOR Circuit 1/2

Number:	1
Horsepower:	3.6
Phase:	3
Rated Load Amps:	13.7
Locked Rotor Amps:	83.1

OUTDOOR MOTOR

Number:	1
Horsepower:	0.33
Motor Speed (RPM):	1100
Phase:	1
Full Load Amps:	1.4
Locked Rotor Amps:	4.6

POWER EXHAUST ACCESSORY (3)

(Field Installed Power Exhaust)

Phase:	N/A
Horsepower:	N/A
Motor Speed (RPM):	N/A
Full Load Amps:	N/A
Locked Rotor Amps:	N/A

FILTERS

Type:	Throwaway
Furnished:	Yes
Number	2
Recommended	20"x35"x2"

REFRIGERANT (2)

Type	R-410
Factory Charge	
Circuit #1	3 1/2"
Circuit #2	N/A

NOTES:

1. Maximum (HACR) Circuit Breaker sizing is for installations in the United States only.
2. Refrigerant charge is an approximate value. For a more precise value, see unit nameplate and service instructions.
3. Value does not include Power Exhaust Accessory.
4. Value includes oversized motor.
5. Value does not include Power Exhaust Accessory.
6. EER is rated at AHRI conditions and in accordance with DOE test procedures.

Unit Dimensions - Trane Precedent Packaged Gas/Electric Rooftop Units
Item: A2 Qty: 1 Tag(s): HVAC-4

ELECTRICAL / GENERAL DATA

GENERAL (2)(4)(6)

		Oversized Motor
Model:	YSC060G	
Unit Operating Voltage:	187-253	MCA: N/A
Unit Primary Voltage:	208	MFS: N/A
Unit Secondary Voltage	230	MCB: N/A
Unit Hertz:	60	
Unit Phase:	3	
EER/SEER	12.0/14.0	

Standard Motor		Field Installed Oversized Motor
MCA:	28.2	MCA: N/A
MFS:	40.0	MFS: N/A
MCB:	40.0	MCB: N/A

HEATING PERFORMANCE

HEATING - GENERAL DATA

Heating Model:	Medium
Heating Input (BTU):	80,000
Heating Output (BTU):	65,600
No. Burners:	2
No. Stages	1

Gas Inlet Pressure

Natural Gas (Min/Mix):	4.5/14.0
LP (Min/Max)	11.0/14.0
Gas Pipe Connection Size:	1/2"

INDOOR MOTOR

Standard Motor		Oversized Motor		Field Installed Oversized Motor	
Number:	1	Number:	N/A	Number:	N/A
Horsepower:	1.0	Horsepower:	N/A	Horsepower:	N/A
Motor Speed (RPM):	--	Motor Speed (RPM):	N/A	Motor Speed (RPM):	N/A
Phase	1	Phase	N/A	Phase	N/A
Full Load Amps:	6.9	Full Load Amps:	N/A	Full Load Amps:	N/A
Locked Rotor Amps:	--	Locked Rotor Amps:	N/A	Locked Rotor Amps:	N/A

COMPRESSOR Circuit 1/2

Number:	1
Horsepower:	4.3
Phase:	3
Rated Load Amps:	15.9
Locked Rotor Amps:	110.0

OUTDOOR MOTOR

Number:	1
Horsepower:	0.40
Motor Speed (RPM):	1100
Phase:	1
Full Load Amps:	1.4
Locked Rotor Amps:	5.2

POWER EXHAUST ACCESSORY (3)

(Field Installed Power Exhaust)

Phase:	N/A
Horsepower:	N/A
Motor Speed (RPM):	N/A
Full Load Amps:	N/A
Locked Rotor Amps:	N/A

FILTERS

Type:	Throwaway
Furnished:	Yes
Number	2
Recommended	20"x35"x2"

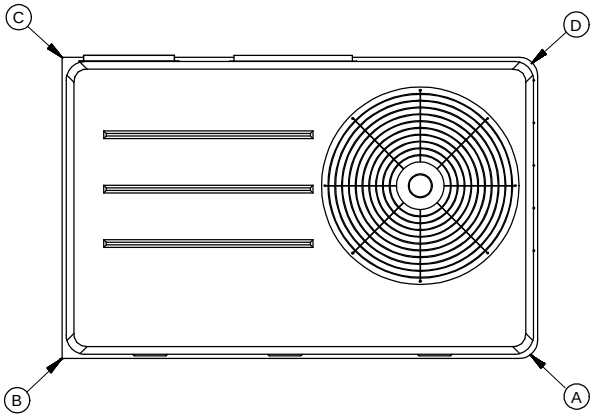
REFRIGERANT (2)

Type	R-410
Factory Charge	
Circuit #1	4.8 lb
Circuit #2	N/A

NOTES:

1. Maximum (HACR) Circuit Breaker sizing is for installations in the United States only.
2. Refrigerant charge is an approximate value. For a more precise value, see unit nameplate and service instructions.
3. Value does not include Power Exhaust Accessory.
4. Value includes oversized motor.
5. Value does not include Power Exhaust Accessory.
6. EER is rated at AHRI conditions and in accordance with DOE test procedures.

Weight, Clearance & Rigging Diagram - Trane Precedent Packaged Gas/Electric Rooftop Units
Item: A1 Qty: 2 Tag(s): HVAC-2, HVAC-6



PACKAGED GAS / ELECTRICAL

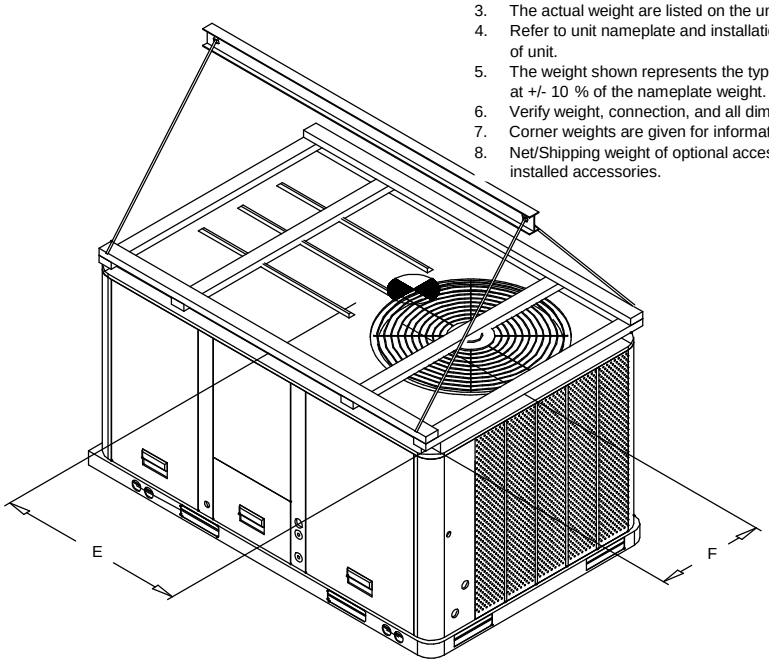
CORNER WEIGHT

INSTALLED ACCESSORIES NET WEIGHT DATA

ACCESSORY	WEIGHTS
ECONOMIZER	26.0 lb
MOTORIZED OUTSIDE AIR DAMPER	
MANUAL OUTSIDE AIR DAMPER	
BAROMETRIC RELIEF	7.0 lb
OVERSIZED MOTOR	
BELT DRIVE MOTOR	
POWER EXHAUST	
THROUGHT THE BASE ELECTRICAL/GAS (FIOPS)	13.0 lb
UNIT MOUNTED CIRCUIT BREAKER (FIOPS)	
UNIT MOUNTED DISCONNECT (FIOPS)	
POWERED CONVENIENCE OUTLET (FIOPS)	
HINGED DOORS (FIOPS)	
HAIL GUARD	12.0 lb
SMOKE DETECTOR, SUPPLY / RETURN	7.0 lb
NOVAR CONTROL	
STAINLESS STEEL HEAT EXCHANGER	
REHEAT	12.0 lb
ROOF CURB	61.0 lb

BASIC UNIT WEIGHTS		CORNER WEIGHTS				CENTER OF GRAVITIY	
SHIPPING	NET	A	205.0 lb	C	46.0 lb	(E) LENGHT	(F) WIDTH
598.0 lb	492.0 lb	B	183.0 lb	D	58.0 lb	33"	9"

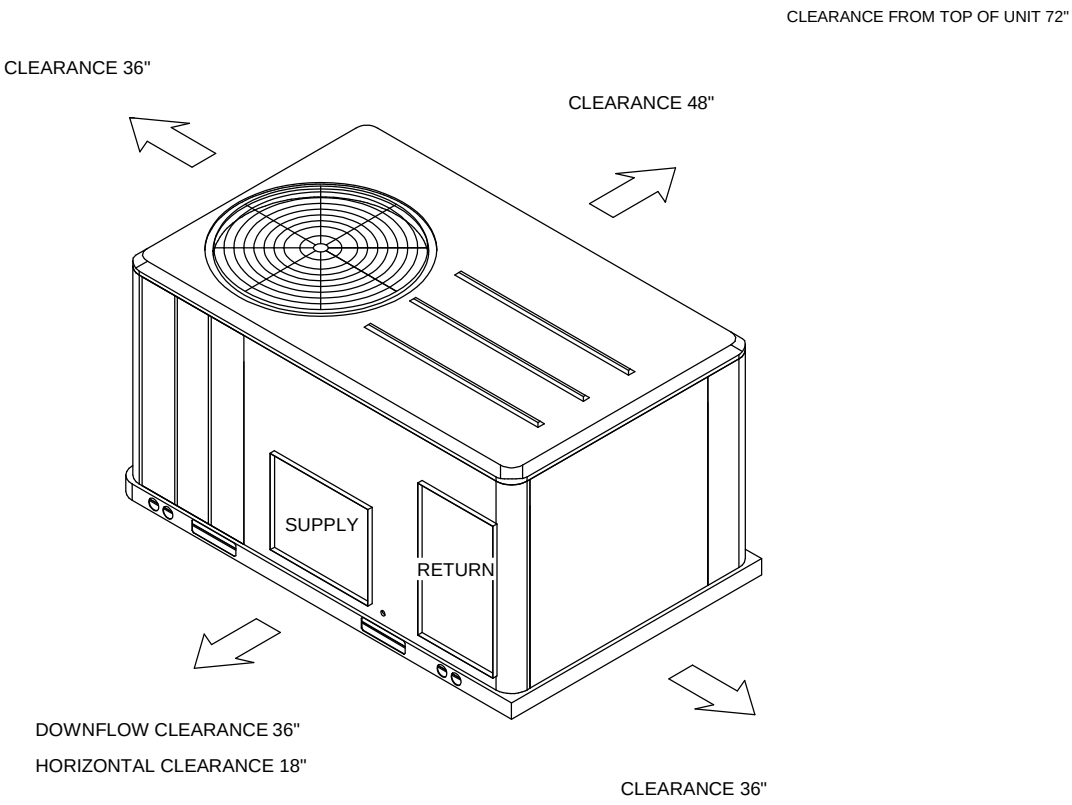
NOTE:
1. All weights are approximate.
2. Weights for options that are not list refer to Installation guide.
3. The actual weight are listed on the unit nameplate.
4. Refer to unit nameplate and installation guide for weights before scheduling transportation and installation of unit.
5. The weight shown represents the typical unit operating weight for the configuration selected. Estimated at +/- 10 % of the nameplate weight. .
6. Verify weight, connection, and all dimension with installer documents before installation.
7. Corner weights are given for information only.
8. Net/Shipping weight of optional accessories should be added to unit weight when ordering factory or field installed accessories.



PACKAGED GAS / ELECTRICAL

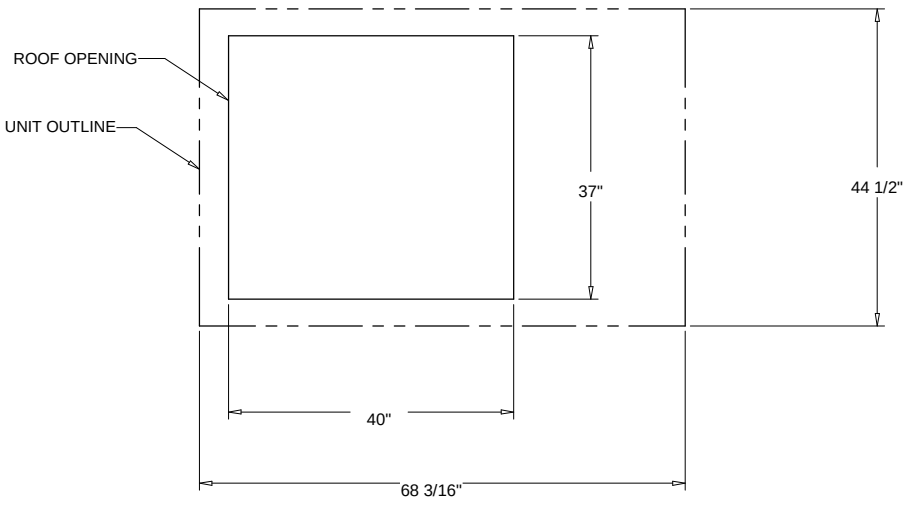
RIGGING AND CENTER OF GRAVITY

Weight, Clearance & Rigging Diagram - Trane Precedent Packaged Gas/Electric Rooftop Units
Item: A1, A2 Qty: 3 Tag(s): HVAC-2, HVAC-6, HVAC-4



PACKAGED GAS / ELECTRIC

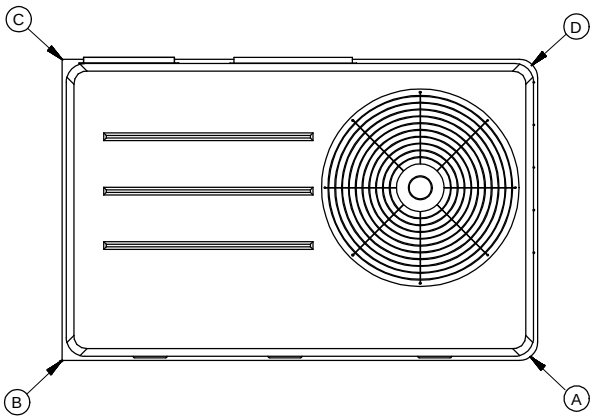
CLEARANCE



PACKAGED GAS / ELECTRIC

DOWNFLOW TYPICAL ROOF OPENING

Weight, Clearance & Rigging Diagram - Trane Precedent Packaged Gas/Electric Rooftop Units
Item: A2 Qty: 1 Tag(s): HVAC-4



PACKAGED GAS / ELECTRICAL

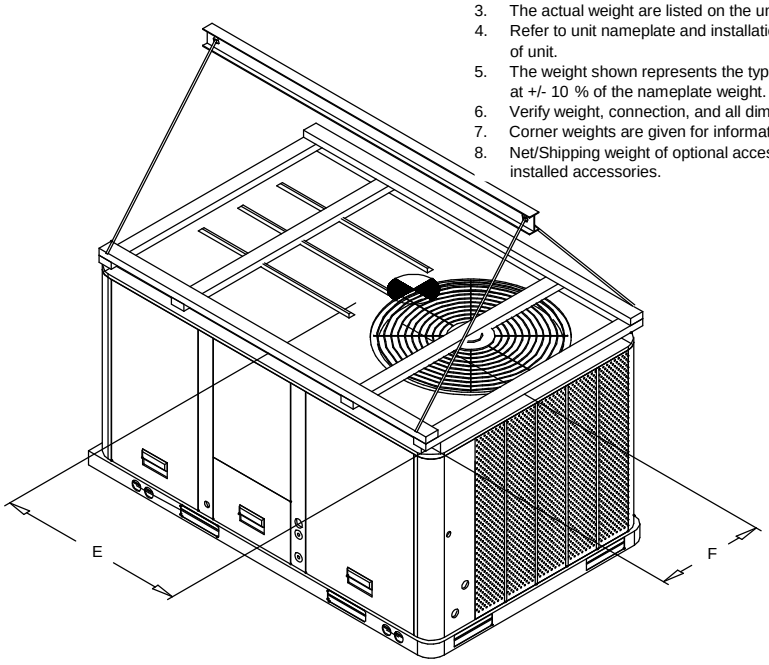
CORNER WEIGHT

INSTALLED ACCESSORIES NET WEIGHT DATA

ACCESSORY	WEIGHTS
ECONOMIZER	26.0 lb
MOTORIZED OUTSIDE AIR DAMPER	
MANUAL OUTSIDE AIR DAMPER	
BAROMETRIC RELIEF	7.0 lb
OVERSIZED MOTOR	
BELT DRIVE MOTOR	
POWER EXHAUST	
THROUGHT THE BASE ELECTRICAL/GAS (FIOPS)	13.0 lb
UNIT MOUNTED CIRCUIT BREAKER (FIOPS)	
UNIT MOUNTED DISCONNECT (FIOPS)	
POWERED CONVENIENCE OUTLET (FIOPS)	
HINGED DOORS (FIOPS)	
HAIL GUARD	12.0 lb
SMOKE DETECTOR, SUPPLY / RETURN	7.0 lb
NOVAR CONTROL	
STAINLESS STEEL HEAT EXCHANGER	
REHEAT	12.0 lb
ROOF CURB	61.0 lb

BASIC UNIT WEIGHTS		CORNER WEIGHTS				CENTER OF GRAVITIY	
SHIPPING	NET	(A)	214.0 lb	(C)	52.0 lb	(E) LENGHT	(F) WIDTH
627.0 lb	522.0 lb	(B)	193.0 lb	(D)	63.0 lb	33"	10"

NOTE:
1. All weights are approximate.
2. Weights for options that are not list refer to Installation guide.
3. The actual weight are listed on the unit nameplate.
4. Refer to unit nameplate and installation guide for weights before scheduling transportation and installation of unit.
5. The weight shown represents the typical unit operating weight for the configuration selected. Estimated at +/- 10 % of the nameplate weight. .
6. Verify weight, connection, and all dimension with installer documents before installation.
7. Corner weights are given for information only.
8. Net/Shipping weight of optional accessories should be added to unit weight when ordering factory or field installed accessories.

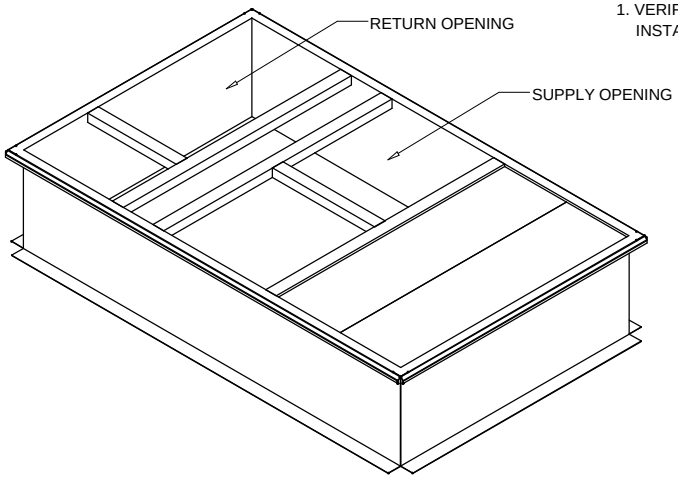


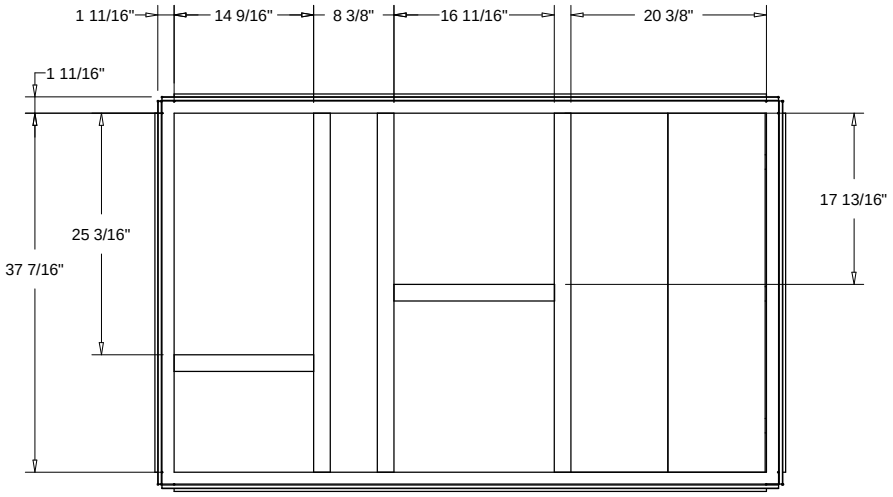
PACKAGED GAS / ELECTRICAL

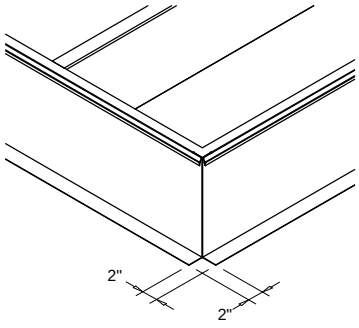
RIGGING AND CENTER OF GRAVITY

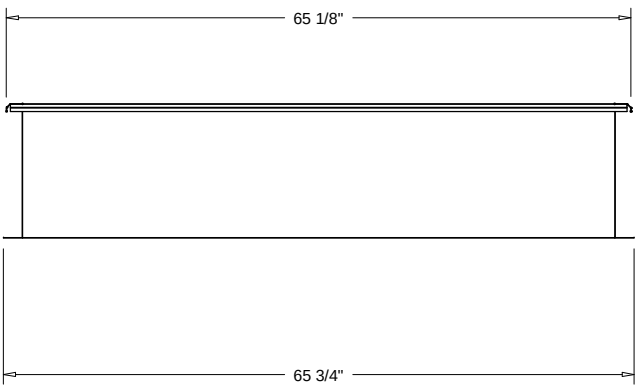
Roof Curb Accessory - Trane Precedent Packaged Gas/Electric Rooftop Units
Item: A1, A2 Qty: 3 Tag(s): HVAC-2, HVAC-6, HVAC-4

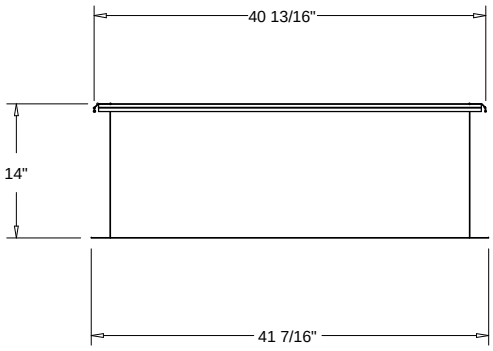
NOTES:
1. VERIFY WEIGHT, CONNECTION, AND ALL DIMENSION WITH INSTALLER DOCUMENTS BEFORE INSTALLATION









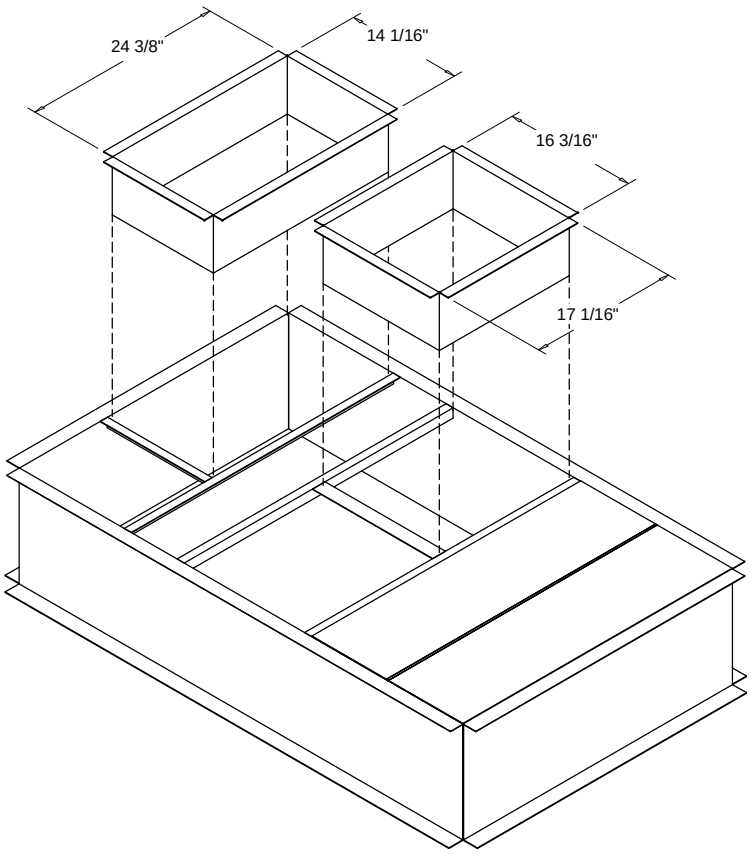


ROOF TOP CURB (BAYCURB042)

ACCESSORY

Roof Curb Accessory - Trane Precedent Packaged Gas/Electric Rooftop Units
Item: A1, A2 Qty: 3 Tag(s): HVAC-2, HVAC-6, HVAC-4

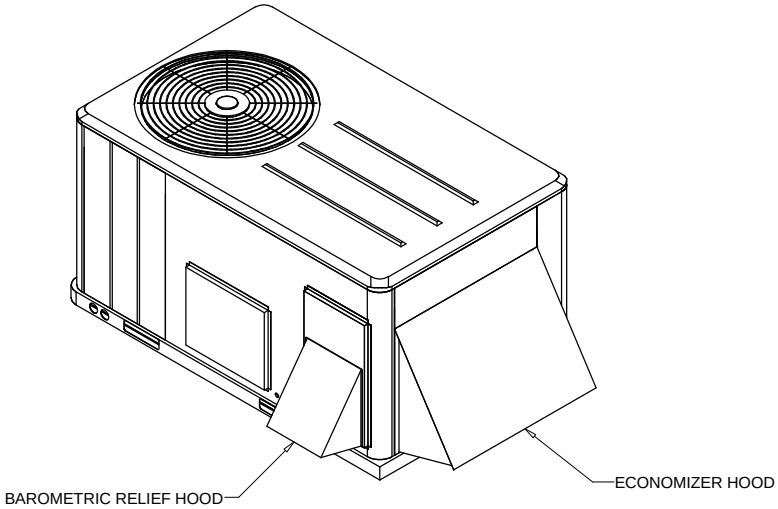
Downflow Duct Connections - Field Fabricated
All Flanges - 1 1/4"

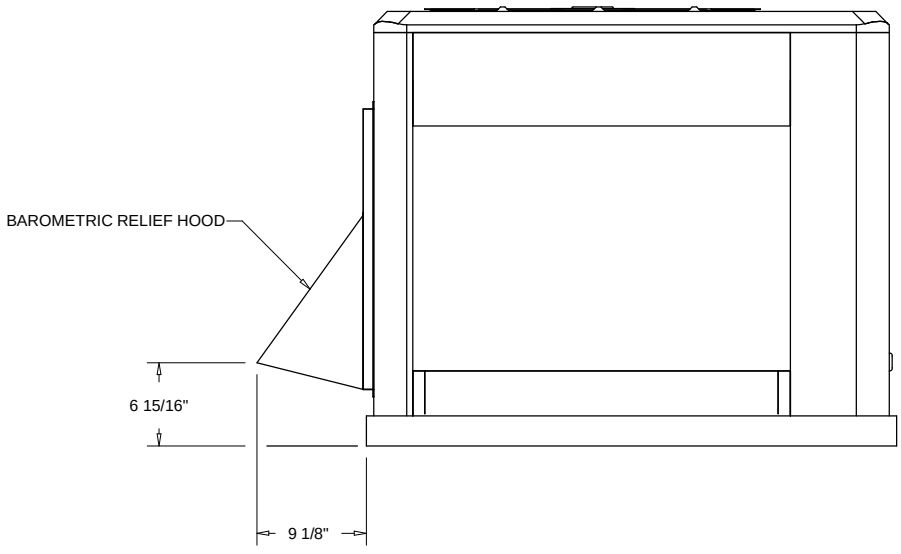


DUCT CONNECTIONS

ACCESSORY

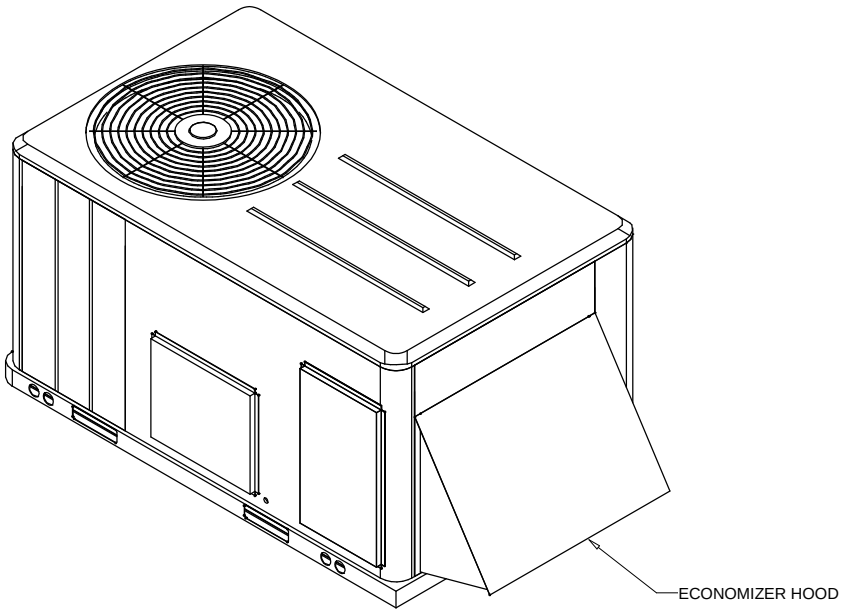
Economizer Accessory - Trane Precedent Packaged Gas/Electric Rooftop Units
Item: A1, A2 Qty: 3 Tag(s): HVAC-2, HVAC-6, HVAC-4

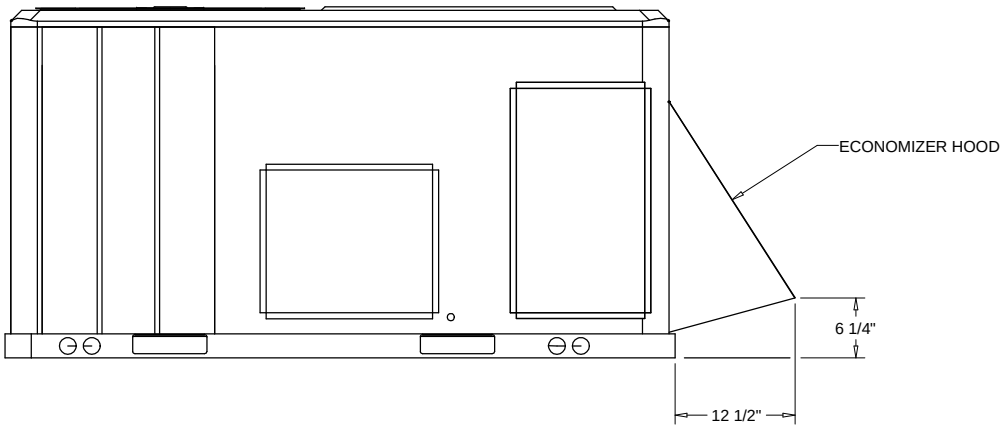




ACCESSORY - BAROMETRIC RELIEF DAMPER HOOD

Economizer Accessory - Trane Precedent Packaged Gas/Electric Rooftop Units
Item: A1, A2 Qty: 3 Tag(s): HVAC-2, HVAC-6, HVAC-4





ACCESSORY - ECONOMIZER HOOD

Tag Data - Trane Foundation 15 Ton Packaged Gas/Electric Rooftops (Qty: 3)

Item	Tag(s)	Qty	Description	Model Number
B1	HVAC-1, HVAC-3, HVAC-5	3	15 Ton Packaged Gas/Electric RTU	GAC180A3EMA--0100C000000000000000000000

Product Data - Trane Foundation 15 Ton Packaged Gas/Electric Rooftops

Item: B1 Qty: 3 Tag(s): HVAC-1, HVAC-3, HVAC-5

Trane Packaged gas/electric rooftop – R410a DX cooling, natural gas heat
15 ton Standard efficiency – 11.0 EER
Convertible configuration – ships as downflow and field convert to horizontal
208-230/60/3
Electro mechanical controls
Medium gas heat – 2 stages
Oversized motor – 5.0hp
Microchannel condenser coil
Through the base gas & electrical
Crankcase heater (Fld)
Horizontal Duct Conversion Kit (Fld)
0-100%Economizer w/ Dry Bulb control (Fld)
Return air smoke detector (Fld)
Condenser coil hail guard (Fld)
Standard 14” tall knockdown uninsulated, non-isolated, non-seismic flat Roof curb (Fld)
Barometric relief (Fld)
1 Year Parts & Labor warranty on entire unit
5 Year compressor & heat exchanger warranty – parts only

Performance Data - Trane Foundation 15 Ton Packaged Gas/Electric Rooftops

Tags	**HVAC-1, HVAC-3, HVAC-5**
Airflow Application	Horizontal
Design Airflow (cfm)	6000
Cooling Entering Dry Bulb (F)	80.00
Cooling Entering Wet Bulb (F)	67.00
Ent Air Rel Humidity (%)	51.08
Ambient Temp (F)	95.00
Cooling Leaving Unit DB (F)	59.94
Cooling Leaving Unit WB (F)	58.05
Gross Total Capacity (MBh)	183.48
Gross Sensible Capacity (MBh)	145.67
Gross Latent Capacity (MBh)	37.81
Net Total Capacity (MBh)	170.14
Net Sensible Capacity (MBh)	132.33
Net Sensible Heat Ratio (Number)	0.78
Heating EAT (F)	60.00
Heating LAT (F)	99.32
Heating Temp Rise (F)	39.32
Output Htg Capacity (MBh)	256.00
Output Htg Capacity w/Fan (MBh)	256.00
Design ESP (in H2O)	1.750
Electric Heat Static Press Add (in H2O)	0.000
Component SP Add (in H2O)	0.200
Field Supplied Drive Kit Required	None
Indoor Mtr. Operating Power (bhp)	4.24
Indoor RPM (rpm)	1056
Indoor Motor Power (kW)	3.16
Outdoor Motor Power (kW)	0.88
Compressor Power (kW)	13.45
System Power (kW)	17.48
IPLV @ AHRI (IPLV)	12.2
MCA (A)	85.00
MOP (A)	110.00
MCA (230 w/ Elec Heat) (A)	0.00
MOP (230 w/Elec Heat) (A)	0.00
Compressor 1 RLA (A)	28.50
Compressor 2 RLA (A)	26.00
Condenser Fan FLA (A)	3.20
Evaporator Fan FLA (A)	16.70
Evaporator Face Area (sq ft)	26.00
Evaporator Face Velocity (ft/min)	231
Evaporator Fin Spacing (Per Foot)	180
Evaporator Rows ( )	3
Min. Unit Operating Weight (lb)	1793.0
Max Unit Operating Weight (lb)	2215.0
Fan Motor Heat (MBh)	13.34
Evap Coil Leav Air Temp (DB) (F)	57.52
Evap Coil Leav Air Temp (WB) (F)	57.12
Dew Point Temp (F)	56.87
Rated capacity (AHRI) (MBh)	176.00
Refrig charge (HFC-410A) - ckt 1 (lb)	11.4
Refrig charge (HFC-410A) - ckt 2 (lb)	6.0
ASHRAE 90.1	Yes
Saturated Suction Temp Circuit 1 (F)	50.49

Tags	**HVAC-1, HVAC-3, HVAC-5**
Saturated Discharge Temp Circuit 1 (F)	118.67
Saturated Suction Temp Circuit 2 (F)	50.96
Saturated Discharge Temp Circuit 2 (F)	122.17
IEER Rating ( )	12.20
EER @ AHRI Conditions (EER)	11.0
Total Static Pressure (in H2O)	1.950

TRANE

Performance Data

Table 8. Evaporator fan performance - 15 ton unit with gas heat - GA*180 - horizontal airflow

External Static Pressure (Inches of Water)																				
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80		0.90		1.00	
cfm	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
	3-hp Standard Motor & Low Static Drive Accessory								3-hp Standard Motor Drive											
4800	488	0.72	532	0.85	572	0.99	609	1.12	643	1.24	675	1.37	707	1.52	738	1.67	767	1.82	796	1.98
5400	539	1.00	578	1.13	615	1.29	650	1.43	683	1.58	714	1.72	743	1.87	771	2.02	800	2.19	827	2.36
6000	591	1.34	626	1.48	660	1.65	693	1.82	724	1.98	754	2.14	782	2.30	809	2.46	834	2.62	860	2.79
6600	643	1.75	675	1.90	706	2.07	738	2.26	767	2.45	795	2.62	823	2.80	849	2.98	873	3.15	897[a]	3.33
7200	696	2.24	725	2.40	754	2.58	783	2.77	811	2.99	838	3.19	864	3.38	889	3.57	913	3.76	937	3.95
															5-hp Oversized Motor & Drive					

Continued

External Static Pressure (Inches of Water)																				
	1.10		1.20		1.30		1.40		1.50		1.60		1.70		1.80		1.90		2.00	
cfm	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
	3-hp Standard Motor & Drive						3-hp Standard Motor & High Static Drive Accessory								5-hp Oversized Motor & Drive					
4800	823	2.13	849	2.29	874	2.44	899	2.60	923	2.76	946	2.91	969	3.07	991	3.23	1012	3.39	1033	3.55
5400	853	2.53	879	2.70	903	2.88	927	3.05	951	3.22	973	3.40	995	3.57	1017	3.75	1038	3.93	1059	4.11
6000	886	2.98	910	3.17	934	3.36	957	3.55	980	3.74	1003	3.94	1024	4.13	1045	4.32	1066	4.52	1086	4.71
6600	920	3.50	944	3.70	967	3.91	990	4.11	1012	4.32	1033	4.53	1054	4.74	1075	4.95	1096	5.16	1116	5.38
7200	959	4.15	981	4.34	1002	4.53	1024	4.74	1045	4.96	1066	5.19	1087	5.42	1107	5.65	---	---	---	---

Notes:
1. For Standard Evaporator Fan Speed (rpm), reference Table 27, p. 42.
2. For High Evaporator Fan Speed (rpm), reference Table 29, p. 42.
3. For Oversized Evaporator Fan Speed (rpm), reference Table 30, p. 42.
4. Fan motor heat (MBh) = 3.15 x Fan bhp.
5. Data includes pressure drop due to standard filters and wet coils. No accessories or options are included in pressure drop data.
6. For all non-standard sheave combinations, please refer to accessory installer's guides ACC-SVN163*-EN and ACC-SVN169*-EN.
7. Factory supplied motors, in commercial equipment, are definite purpose motors, specifically designed and tested to operate reliably and continuously at all cataloged conditions. Using the full horsepower range of our fan motors as shown in our tabular data will not result in nuisance tripping or premature motor failure. Our product's warranty will not be affected.

(a) 3HP Standard Motor & High Static Drive Accessory

Mechanical Specifications - Trane Foundation 15 Ton Packaged Gas/Electric Rooftops
Item: B1 Qty: 3 Tag(s): HVAC-1, HVAC-3, HVAC-5

General
The units shall be dedicated downflow or horizontal airflow. The operating range shall be between 115°F and 40°F in cooling as standard from the factory for all units. Cooling performance shall be rated in accordance with ARI testing procedures. All units shall be factory assembled, internally wired, fully charged with R-410A, and 100 percent run tested to check cooling operation, fan and blower rotation and control sequence, before leaving the factory. Wiring internal to the unit shall be colored and numbered for simplified identification. Units shall be UL listed and labeled, classified in accordance to UL 1995/C 22.2, 236-05 3rd Edition.

Casing
Unit casing shall be constructed of zinc coated, heavy gauge, galvanized steel. Exterior surfaces shall be cleaned, phosphatized, and finished with a weather-resistant baked enamel finish. Unit's surface shall be tested 672 hours in a salt spray test in compliance with ASTM B117. Cabinet construction shall allow for all maintenance on one side of the unit. In order to ensure a water and air tight seal, service panels shall have lifting handles and no more than three screws to remove. All exposed vertical panels and top covers in the indoor air section shall be insulated with a 1/2", 1.0 lbdensity foil-faced, fire-resistant, permanent, odorless, glass fiber material. The base of the downflow unit shall be insulated with 1/2", 1.0 lbdensity foil-faced, closed-cell material. The downflow unit¿s base pan shall have no penetrations within the perimeter of the curb other than the raised 1 1/8"high supply/return openings to provide an added water integrity precaution, if the condensate drain backs up. The base of the unit shall have provisions for forklift and crane lifting.

Compressors
All units shall have direct-drive, hermetic, scroll type compressors with centrifugal type oil pumps. Motor shall be suction gas-cooled and shall have a voltage utilization range of plus or minus 10 percent of nameplate voltage. Internal overloads shall be provided with the scroll compressors. All models shall have phase monitors and low and high pressure control as standard.

Controls
Unit shall be completely factory wired with necessary controls and contactor pressure lugs or terminal block for power wiring. Unit shall provide an external location for mounting a fused disconnect device.

Discharge Line Thermostat
A bi-metal element discharge line thermostat is installed as a standard option on the discharge line of each system. This standard option provides extra protection to the compressors against high discharge temperatures in case of loss of charge, extremely high ambient and other conditions which could drive the discharge temperature higher. Discharge line thermostat is wired in series with high pressure control. When the discharge temperature rises above the protection limit, the bi-metal disc in the thermostat switches to the off position, opening the 24 Vac circuit. When the temperature on the discharge line cools down, the bi-metal disc closes the contactor circuit, providing power to the compressor.

Evaporator and Condenser Coils
Microchannel coils will be burst tested by the manufacturer. Internally finned, 5/16" copper tubes mechanically bonded to a configured aluminum plate fin shall be standard for evaporator coils. Microchannel condenser coils shall be standard on all units. Coils shall be leak tested to ensure the pressure integrity. The evaporator coil and condenser coil shall be leak tested to 225 psig and pressure tested to 450 psig. Sloped condensate drain pans are standard.

Filters
Two inch standard filters shall be factory supplied on all units.

Gas Heating Section
The heating section shall have a progressive tubular heat exchanger design. An induced draft combustion blower shall be used to pull the combustion products through the firing tubes.The heater shall use a direct spark ignition (DSI) system. On initial call for heat, the combustion blower shall purge the heat exchanger for 20 seconds before ignition. After three unsuccessful ignition attempts, the entire heating system shall be locked out until manually reset at the thermostat. Units shall be suitable for use with natural gas or propane (field-installed kit) and also comply with the California requirement for low NOx emissions (Gas/Electric Only).

High Pressure Control
All units include High Pressure Cutout as standard.

Indoor Fan
Units above shall have belt driven, FC centrifugal fans with adjustable motor sheaves. Units with standard motors shall have an adjustable idler-arm assembly for quick-adjustment of fan belts and motor sheaves. All motors shall be

thermally protected. Oversized motors shall be available for high static application. All indoor fan motors meet the U.S. Energy Policy Act of 1992 (EPACT).

Low Pressure Control
All units include Low Pressure Cutout as standard.

Outdoor Fans
The outdoor fan shall be direct-drive, statically and dynamically balanced, draw-through in the vertical discharge position. The fan motor(s) shall be permanently lubricated and shall have builtin thermal overload protection.

Phase Monitor
The Phase Monitor is a three-phase line monitor module that protects against phase loss, phase reversal and phase unbalance. It is intended to protect compressors from reverse rotation. It has an operating input voltage range of 190-600 Vac, and LED indicators for ON and FAULT. There are no field adjustments and the module will automatically reset from a fault condition.

Refrigerant Circuits
Each refrigerant circuit shall have independent fixed orifice, service pressure ports, and refrigerant line filter driers factory installed as standard. An area shall be provided for replacement suction line driers.

Unit Top
The top cover shall be double hemmed and gasket sealed to prevent water leakage.

Oversized Motors
Oversized motors shall be available for high static applications.

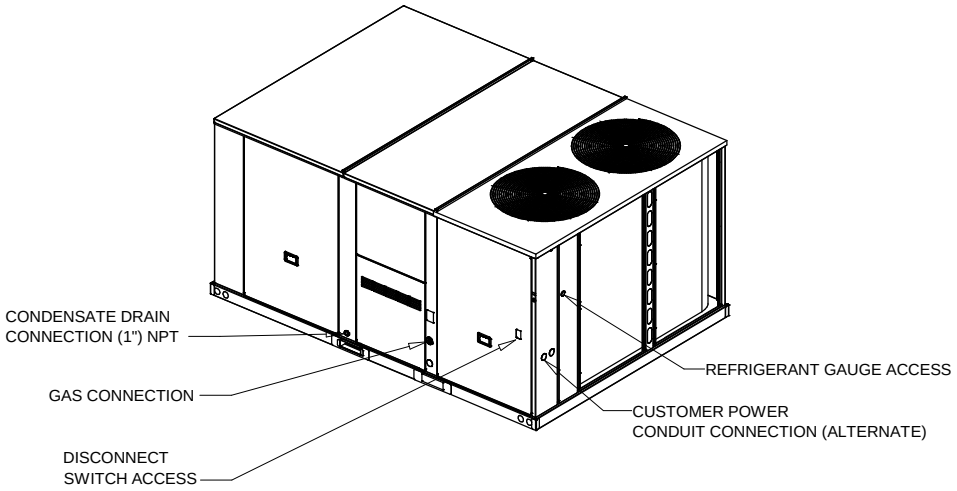
Through the Base Utilities Access
An electrical service entrance shall be provided allowing electrical access for both control and main power connections inside the curb and through the base of the unit. Option will allow for field installation of liquid-tight conduit and an external field installed disconnect switch.

Economizer-Horizontal
The horizontal economizer shall contain the same features as the downflow economizer with the exception of barometric relief.

Roof Curb - Field Installed
The roof curb shall be designed to mate with the downflow unit and provide support and a water tight installation when installed properly. The roof curb design shall allow field-fabricated rectangular supply/return ductwork to be connected directly to the curb. Curb shall be shipped knocked down for field assembly and shall include wood nailer strips.

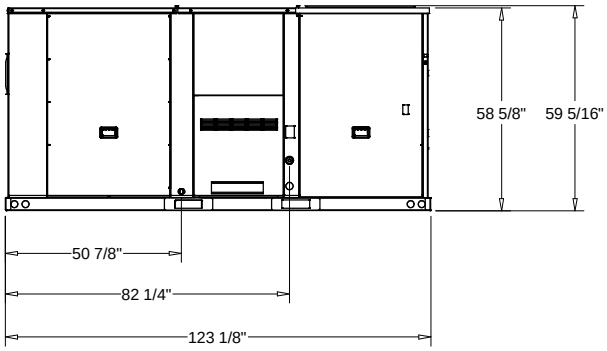
Tool-less Hail Guards - Field Installed
Tool-less, hail protection quality coil guards are available for condenser coil protection

Unit Dimensions - Trane Foundation 15 Ton Packaged Gas/Electric Rooftops
Item: B1 Qty: 3 Tag(s): HVAC-1, HVAC-3, HVAC-5



PACKAGED GAS / ELEC HORIZONTAL

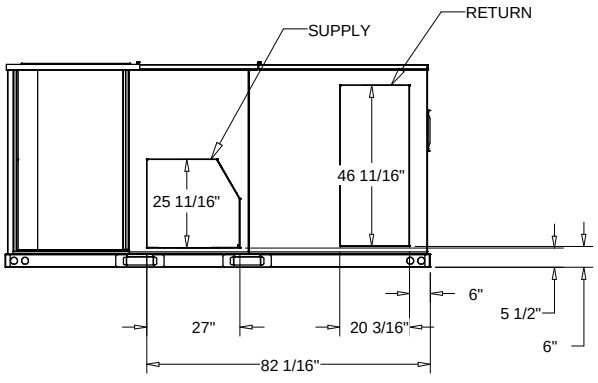
DIMENSION DRAWING



NOTES:
1. THRU -THE -BASE ELECTRICAL IS NOT STANDARD ON ALL UNITS.
2. VERIFY WEIGHT, CONNECTION, AND ALL DIMENSION WITH INSTALLER DOCUMENTS BEFORE INSTALLATION

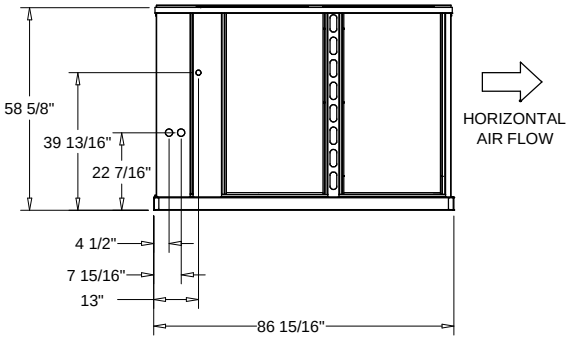
FRONT VIEW OF UNIT

DIMENSION DRAWING



BACK VIEW OF UNIT

DIMENSION DRAWING



RIGHT SIDE VIEW OF UNIT

DIMENSION DRAWING

Unit Dimensions - Trane Foundation 15 Ton Packaged Gas/Electric Rooftops
Item: B1 Qty: 3 Tag(s): HVAC-1, HVAC-3, HVAC-5

ELECTRICAL / GENERAL DATA

GENERAL (2)(4)(6)(7)(10)

Model:	GAC180	Oversized Motor
Unit Operating Voltage:	-	MCA: 85.0
Unit Primary Voltage:	208	MFS: 110.0
Unit Secondary Voltage	230	MCB: 110.0
Unit Hertz:	60	
Unit Phase:	3	
EER:	11	
IEER One Speed Fan:	11.5	
IEER Multi Speed Fan:	-	
Standard Motor		Field Installed Oversized Motor
MCA:	79.0	MCA:
MFS:	100.0	MFS:
MCB:	100.0	MCB:

HEATING PERFORMANCE

HEATING - GENERAL DATA

Heating Model:	Medium
Heating Input (BTU):	320000/224000
Heating Output (BTU):	256000/179200
No. Burners:	8
No. Stages	2
Gas Inlet Pressure	
Natural Gas (Min/Max):	4.5 / 14.0 in. wc
LP (Min/Max)	11.0 / 14.0 in. wc
Gas Pipe Connection Size:	3/4"

INDOOR MOTOR

Standard Motor		Oversized Motor		Field Installed Oversized Motor	
Number:	1	Number:	1	Number:	
Horsepower:	3.0	Horsepower:	5.0	Horsepower:	
Motor Speed (RPM):	1750	Motor Speed (RPM):	3450	Motor Speed (RPM):	
Phase	3	Phase	3	Phase	
Full Load Amps:	10.6	Full Load Amps:	16.7	Full Load Amps:	
Locked Rotor Amps:	81.0	Locked Rotor Amps:	109.8	Locked Rotor Amps:	

COMPRESSOR Circuit 1/2

Number:	2
Horsepower:	7.0/6.0
Phase:	3
Rated Load Amps:	28.5/26.0
Locked Rotor Amps:	164.0/164.0

OUTDOOR MOTOR

Number:	2
Horsepower:	0.5
Motor Speed (RPM):	1100
Phase:	1
Full Load Amps:	3.2
Locked Rotor Amps:	8.8

POWER EXHAUST ACCESSORY (3)

(Field Installed Power Exhaust)

Phase:	
Horsepower:	
Motor Speed (RPM):	
Full Load Amps:	
Locked Rotor Amps:	

FILTERS

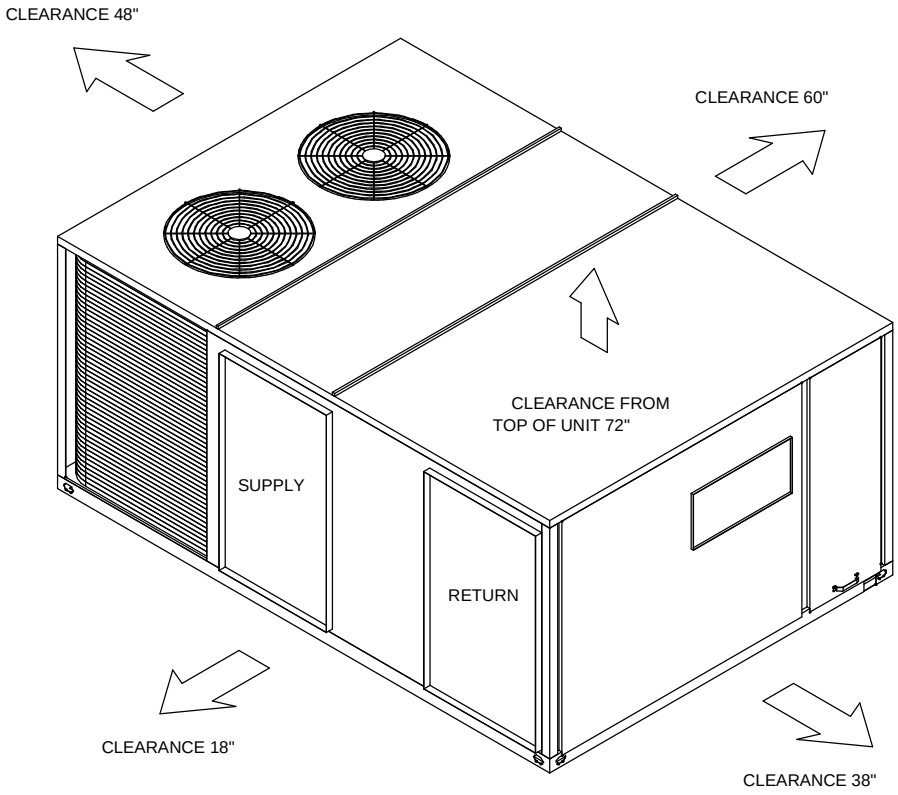
Type:	Throwaway
Furnished:	Yes
Number	8
Recommended	20"x25"x2"

REFRIGERANT (2)

R-410A	R-410A
	7.6 lb / 7.0 lb

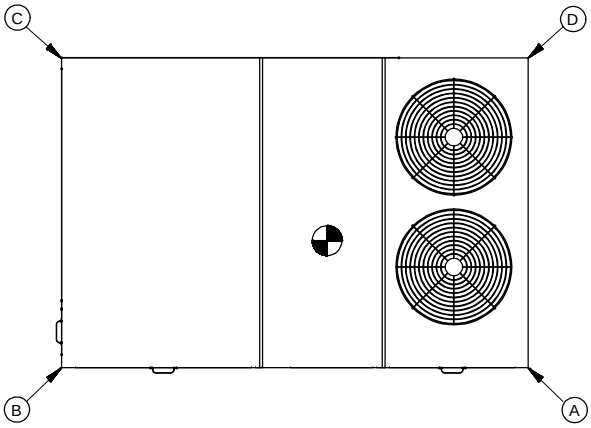
NOTES:
1. Maximum (HACR) Circuit Breaker sizing is for installations in the United States only.
2. Refrigerant charge is an approximate value. For a more precise value, see unit nameplate and service instructions.
3. Value does not include Power Exhaust Accessory.
4. Value does not include Heater.
5. Value include Standard Motor.
6. Value include Oversized Motor
7. EER is rated at AHRI conditions and in accordance with DOE test procedures.
8. For Compressor Motors and Condenser Fan Motors: Amp draw for each motor; multiply value by number of motors to determine total amps.
9. HP for each compressor.
10. Integrated Energy Efficiency Ratio (IEER) is rated in accordance with AHRI standard 210/240 or 360.

Weight, Clearance & Rigging Diagram - Trane Foundation 15 Ton Packaged Gas/Electric Rooftops
Item: B1 Qty: 3 Tag(s): HVAC-1, HVAC-3, HVAC-5



HORIZONTAL ISOMETRIC-PACKAGED COOLING WITH ELECTRIC CLEAERANCE

Weight, Clearance & Rigging Diagram - Trane Foundation 15 Ton Packaged Gas/Electric Rooftops
Item: B1 Qty: 3 Tag(s): HVAC-1, HVAC-3, HVAC-5



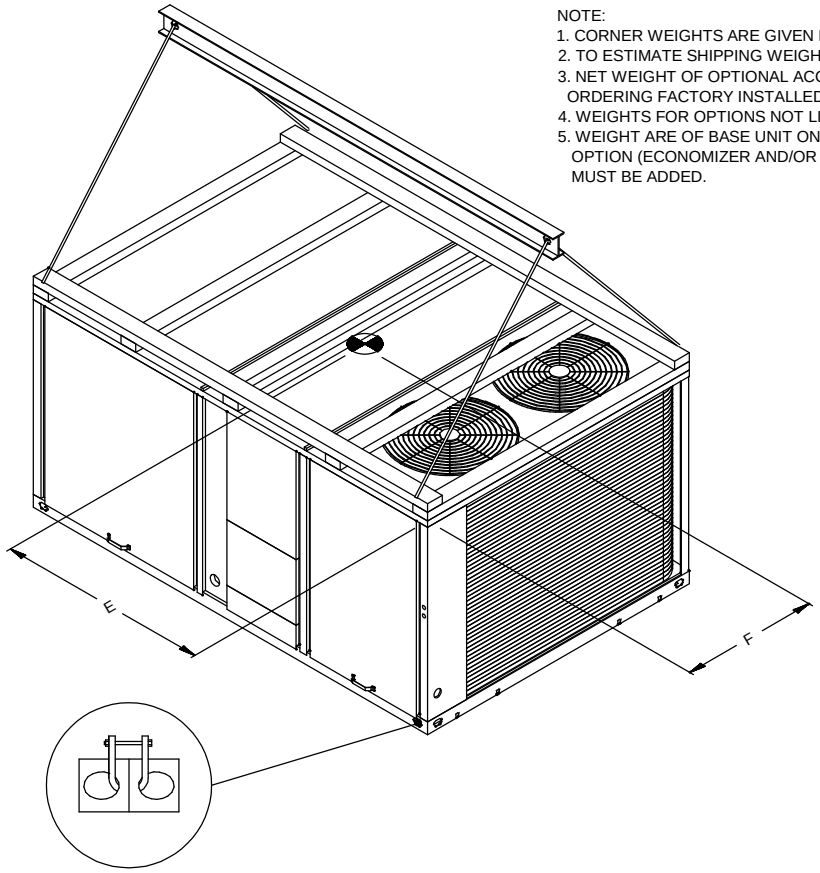
CORNER WEIGHT

INSTALLED ACCESSORIES NET WEIGHT DATA

ACCESSORY	WEIGHTS
ECONOMIZER	91.0 lb
MOTORIZED OUTSIDE AIR DAMPER	
MANUAL OUTSIDE AIR DAMPER	
OVERSIZED MOTOR	2.0 lb
MULTI-SPEED WITH DRIVE	
THROUGHT THE BASE ELECTRICAL)	22.0 lb
BAROMETRIC	
ROOF CURB	235.0 lb
POWER EXHAUST	

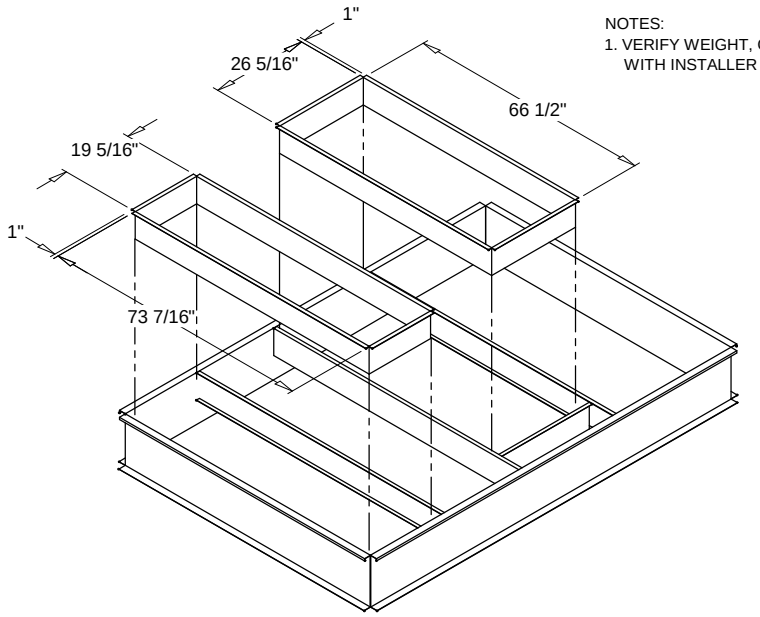
BASE UNIT WEIGHTS		CORNER WEIGHTS				CENTER OF GRAVITIY	
SHIPPING	NET	(A)	626.0 lb	(C)	371.0 lb	(E) LENGHT	(F) WIDTH
2183.0 lb	1864.0 lb	(B)	439.0 lb	(D)	427.0 lb	54"	37"

NOTE:
1. CORNER WEIGHTS ARE GIVEN FOR INFORMATION ONLY.
2. TO ESTIMATE SHIPPING WEIGHT OF OPTION/ACCESSORIES ADD 5 LBS TO NET WEIGHT.
3. NET WEIGHT OF OPTIONAL ACCESSORIES SHOULD BE ADD TO UNIT WEIGHT WHEN ORDERING FACTORY INSTALLED ACCESSORIES.
4. WEIGHTS FOR OPTIONS NOT LISTED ARE < 5 LBS.
5. WEIGHT ARE OF BASE UNIT ONLY. FOR TOTAL WEIGHT, 10 DIGIT FACTORY INSTALLED OPTION (ECONOMIZER AND/OR OVERSIZED MOTOR OR FIOP/ACCESSORY WEIGHT MUST BE ADDED.



RIGGING AND CENTER OF GRAVITY

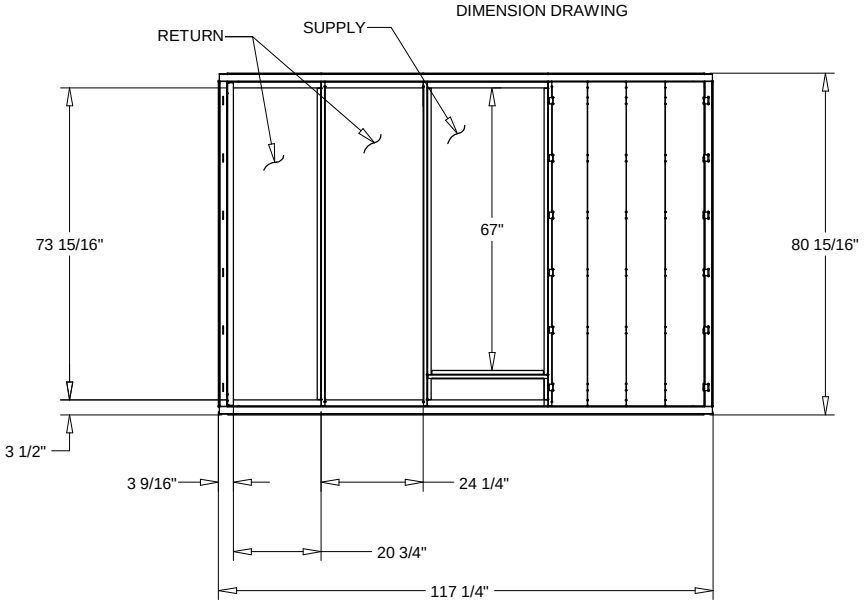
Roof Curb Accessory - Trane Foundation 15 Ton Packaged Gas/Electric Rooftops
Item: B1 Qty: 3 Tag(s): HVAC-1, HVAC-3, HVAC-5



NOTES:
1. VERIFY WEIGHT, CONNECTION, AND ALL DIMENSION WITH INSTALLER DOCUMENTS BEFORE INSTALLATION

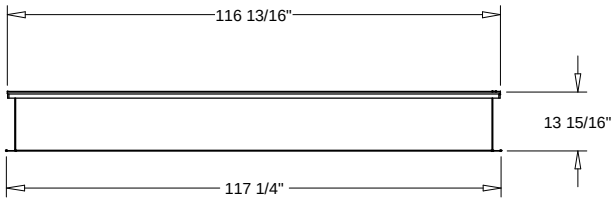
PACKAGED COOLING ROOF CURB

DIMENSION DRAWING



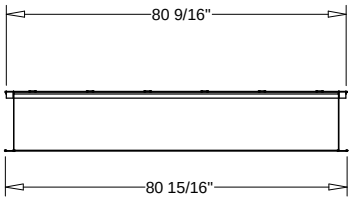
PLAN VIEW OF UNIT

DIMENSION DRAWING



FRONT VIEW OF UNIT

DIMENSION DRAWING

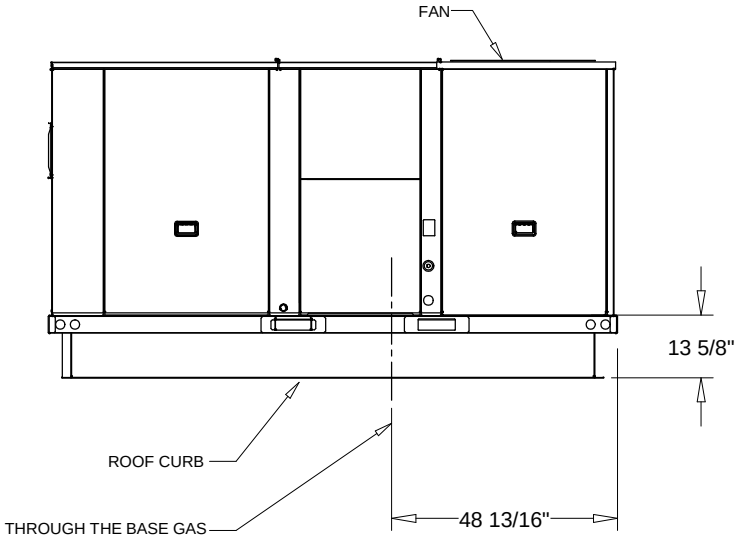


RIGHT VIEW OF UNIT

DIMENSION DRAWING

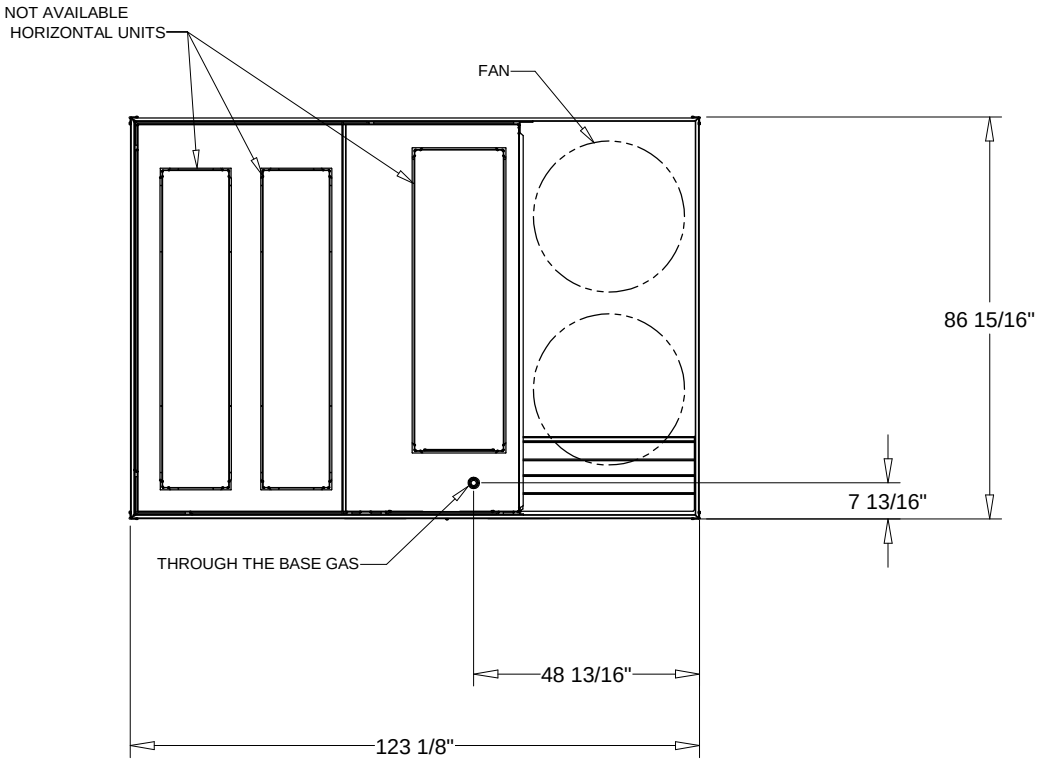
Accessory - Trane Foundation 15 Ton Packaged Gas/Electric Rooftops
Item: B1 Qty: 3 Tag(s): HVAC-1, HVAC-3, HVAC-5

NOTES:
1. THRU -THE -BASE GAS AND ELECTRICAL IS NOT STANDARD ON ALL UNITS.
2. VERIFY WEIGHT, CONNECTION, AND ALL DIMENSION WITH INSTALLER DOCUMENTS BEFORE INSTALLATION



FRONT WITH ROOF CURB VIEW OF UNIT

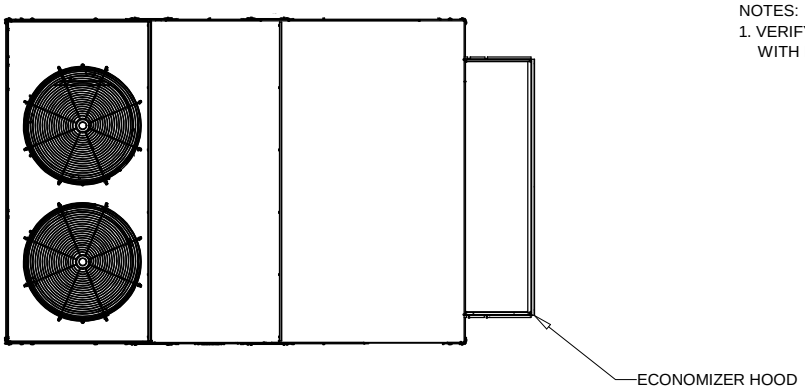
DIMENSION DRAWING



PLAN VIEW OF UNIT

DIMENSION DRAWING

Economizer Accessory - Trane Foundation 15 Ton Packaged Gas/Electric Rooftops
Item: B1 Qty: 3 Tag(s): HVAC-1, HVAC-3, HVAC-5



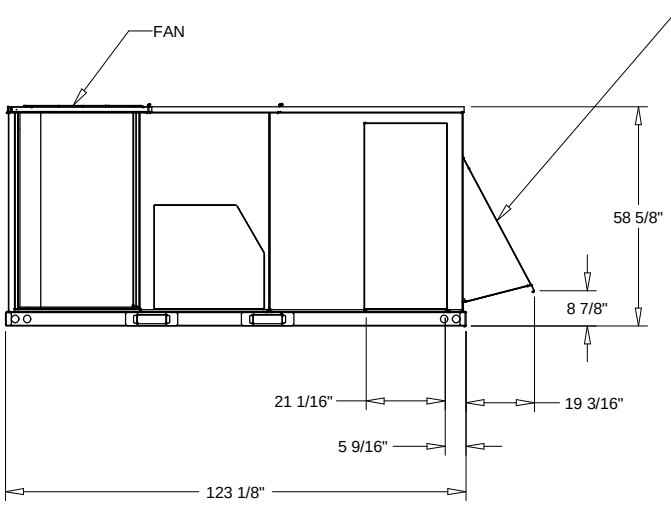
NOTES:
1. VERIFY WEIGHT, CONNECTION, AND ALL DIMENSION WITH INSTALLER DOCUMENTS BEFORE INSTALLATION

PLAN VIEW OF UNIT

DIMENSION DRAWING

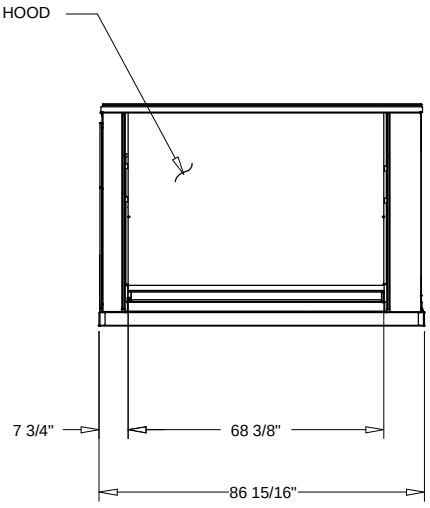
ECONOMIZER

DIMENSION DRAWING



BACK VIEW OF UNIT

DIMENSION DRAWING



LEFT VIEW OF UNIT

DIMENSION DRAWING

Field Installed Options - Part/Order Number Summary
This is a report to help you locate field installed options that arrive at the jobsite. This report provides part or order numbers for each field installed option, and references it to a specific product tag. It is NOT intended as a bill of material for the job.

Product Family – Trane Precedent Packaged Gas/Electric Rooftop

Item	Tag(s)	Qty	Description	Model Number
A1	HVAC-2, HVAC-6	2	4 Ton Packaged Gas/Electric RTU	YSC048G3EMA--C001C000 02A0000000000000000
A2	HVAC-4	1	5 Ton Packaged Gas/Electric RTU	YSC060G3EMA--C001C000 02A0000000000000000

Field Installed Option Description	Part/Ordering Number
Roof curb	BAYCURB042A
Barometric relief	BAYBARM010A

Product Family - Trane Foundation 15 Ton Packaged Gas/Electric Rooftops

Item	Tag(s)	Qty	Description	Model Number
B1	HVAC-1, HVAC-3, HVAC-5	3	15 Ton Packaged Gas/Electric RTU	GAC180A3EMA--0 100C00000000000 00000000000

Field Installed Option Description	Part/Ordering Number
Horizontal Duct Conversion Kit	BAYHZRT001A
Roof curb	BAYCURB027B
Condenser coil hail guard	BAYGARD300A
Crankcase Heater	BAYCCHT300A
0-100% Economizer,Dry Bulb - Horizontal	BAYECON301A
BAYBARO300 - Barometric Relief Damper	BAYBARO300A

AIR PRODUCTS AND CONTROLS

You in Control

SL-2000 SERIES

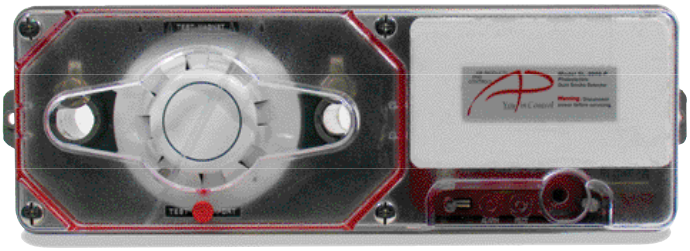
DUCT SMOKE DETECTORS

Hi-Temp, Low-Flow & No-Tools

PRODUCT APPLICATION

The SL-2000 Series Conventional Duct Detector is the latest innovation for early detection of smoke and products of combustion present in air moving through HVAC ducts in Commercial, Industrial, and Residential applications. The unit is designed to prevent the recirculation or spread of smoke by air handling systems, fans and blowers. Complete systems may be shut down in the event of smoke detection. The SL-2000 is designed and built to meet all local code requirements, as well as the NFPA and ICC standards regarding HVAC supply and return duct smoke detectors. Output terminals are provided for a wide range of remote accessories such as horns, strobes, remote status indicators, and test/reset key switches or push buttons.

PRODUCT DESCRIPTION



The SL-2000 includes many features that represent true innovations from current generation duct smoke detectors. Our traditional installer/servicer-friendly approach has been closely followed and expanded throughout the SL-2000. This philosophy provides a new level of efficiency in after-purchase value to both the installer/servicer and end-user. Our attention to detail has yielded a host of "No-Tools Required" features, as well as a multi-application performance level as yet unmatched in the industry. Innovative product combined with unsurpassed customer service equals the right combination for all of your projects. The key features below detail many of the customer-driven innovations incorporated in the SL-2000 Series.

SIGNALING c UL us LISTED

CSFM LISTED

MEA ACCEPTED

FEATURES

- Low-Flow Technology: Both Ionization and Photoelectric models listed for velocities between 100-4000 ft./min
- Both models listed for high-temperature applications
- Operating voltages: 230VAC, 115VAC, 24VAC, 24VDC
- Interconnect up to 30 units for common functions
- Patented "No-Tools Required" front *or* rear loading and removing sampling/exhaust tubes
- Patented "Test Port Valve" allows for aerosol smoke testing without cover removal
- Clear cover fitted with four captive "No-Tools Required" thumbscrews
- Instantaneous cover removal trouble indication
- Staggered terminal blocks for easier wiring
- Flashing LED on detector head indicates normal operation
- Magnet test capability (magnet included)
- More wiring space than competitive models
- Footprint allows easy retrofit in many applications without additional drilling
- Over 15 remote accessories available
- Duct wall gaskets on back of enclosure are pre-installed
- Compatible with the WP-2000 weatherproof enclosure
- Reset switch is also an alarm test switch - competitive models require a magnet or cover removal to test at unit
- Unit includes green pilot and red alarm visual indicators
- External mounting tabs do not require cover removal to install
- Colored cover gasket indicates proper cover seal
- UL, CUL, CSFM, and MEA Listed
- Compact, lightweight size means easy handling, lower shipping costs
- Two sets of 10A form "C" alarm contacts
- One set of 2A form "A" alarm contacts
- One set of 10A form "C" trouble contacts
- Large terminal connection screws
- Standard interchangeable "plug-in" UL268 photoelectric or ionization heads
- Advanced detector head design yields internal dust filtering
- No additional screens or filters to clean
- Compatible with building automation and fire alarm systems
- Ionization and Photoelectric versions available
- Complete wiring details permanently attached to unit

Air Products and Controls
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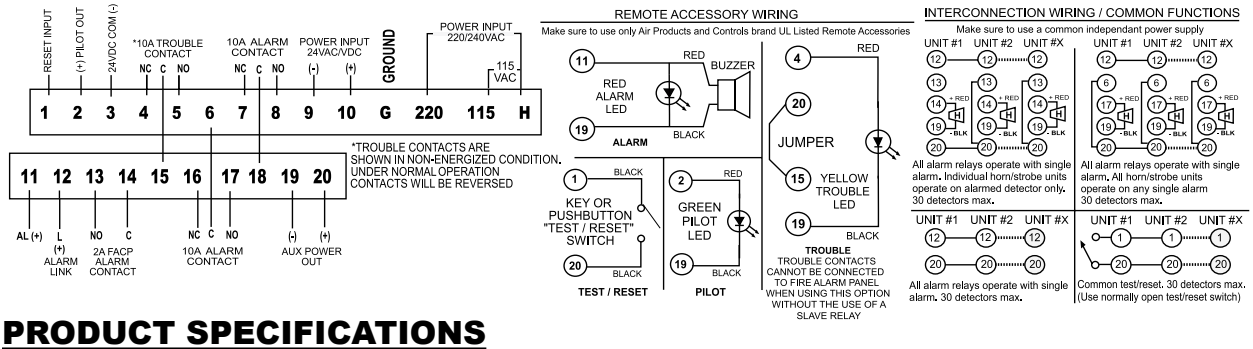
WIRING



PRODUCT SPECIFICATIONS

MODEL NUMBER:	**SL-2000-N**	Ionization: 230VAC, 115VAC, 24VAC, 24VDC
	SL-2000-P	Photoelectric: 230VAC, 115VAC, 24VAC, 24VDC
DETECTOR MODEL NUMBER:	**SL-2000-N**	55000-225APO
	SL-2000-P	55000-328APO
SAMPLING TUBES:	**FAST Tube**	Sectional sampling tube, kit fits up to 90" duct width
	STN-1.0	Sampling tube for 12" or less duct width
	STN-2.5	Sampling tube for 6" to 2.5' duct width
	STN-5.0	Sampling tube for 2.5' to 5.0' duct width
	STN-10.0	Sampling tube for 5.0' to 10.0' duct width
ACCESSORIES:	MS- and MSR-Series remote accessories, WP-2000 weatherproof enclosure, TG-2000 aerosol test gas, and T-PB power supplies (All available from Apollo America)	
POWER REQUIREMENTS: (without accessories)	230VAC	12 mA
Standby:	115VAC	22 mA
	24VAC	55 mA
	24VDC	14 mA
Alarm:	230VAC	18 mA
	115VAC	32 mA
	24VAC	190 mA
	24VDC	68 mA
RELAY CONTACT RATING:		
Alarm Contacts:	Resistive load: 2 sets form "C" rated at 10 Amps @ 115VAC Resistive load: 1 set form "A" rated at 2 Amps	
Trouble Contacts:	Resistive load: 1 set form "C" rated at 10 Amps @ 115VAC	
AIR VELOCITY:	100 to 4,000 ft./min.	
AMBIENT TEMPERATURE:	**SL-2000-N**	32ºF to 158ºF (0ºC to 70ºC)
	SL-2000-P	32ºF to 140ºF (0ºC to 60ºC)
HUMIDITY:	85 ±5 % RH (@32 ±2°C; 86 ±3.6°F) Non-Condensing / Non-Freezing	
WIRING:	Solid or stranded: #12 to #22 AWG terminals	
APPROVALS:	UL & CUL Listed (UL268A, UROX, UROX7) File # S2829 CSFM Listed (3240-1004:105) MEA Accepted (73-92-E; VOL. 27)	
MATERIAL:	Grey plastic backbox, clear plastic cover (Makrolon 94V-0)	
DIMENSIONS:	13 ½" L x 4 ½" W x 2 ¼" H	
MAX. NET WT.:	2 ½ lbs.	
RADIOACTIVE ELEMENT:	For **SL-2000-N** (Ionization) Americium 241; 0.9 Micro-Curie Do not expose to corrosive atmospheres	
HARDWARE:	7" exhaust tube, sampling tube end cap, mounting template, test magnet, and mounting hardware included	

ENGINEERS & ARCHITECTS SPECIFICATIONS

- Air duct smoke detectors shall be Air Products and Controls SL-2000 Series. For ionization detectors the model number is **SL-2000-N**.
- For photoelectric detectors the model number is **SL-2000-P**. The detectors shall be listed by Underwriters Laboratories per UL 268A.
- The detectors shall operate at air velocities from 100 feet per minute to 4,000 feet per minute and at temperatures of no greater than 140°F (60°C).
- Visual indication of alarm and power must be provided on the detector front.
- A manual reset switch shall be located on front of the device.
- Detector head shall not require additional filters or screens which must be maintained, and shall include both a standby and alarm visual indication.
- The housing shall contain a detector base which will accept photoelectric or ionization detector heads.
- Terminal connections shall be of the screw type, a minimum of #6 screw (#12 to #22 AWG compatible). Terminals shall be provided for remote pilot, remote alarm indications, strobe/horn, and remote test/reset switch. All wiring must comply with local codes and regulations.
- A method of testing the alarm function with a magnet must be provided.
- A method of smoke testing the detector without removing the cover must be provided.
- All unit, remote accessory, and common function connection designations must be permanently affixed to the unit.
- Cover and sampling/exhaust tube installation or removal must not require the use of tools.
- Capability for interconnection of up to 30 units shall be provided for common functions.
- Sample and exhaust tubes shall be capable of removal/installation from the front and/or rear of the detector for inspection/maintenance.

AIR PRODUCTS AND CONTROLS

You in Control

AIR PRODUCTS AND CONTROLS INC.
INSTALLATION AND MAINTENANCE INSTRUCTIONS FOR SL-2000 SERIES DUCT SMOKE DETECTORS

SL-2000-N 4-Wire, Ionization Type
SL-2000-P 4-Wire, Photoelectric Type

PRODUCT OVERVIEW

PRODUCT APPLICATION

SL-2000 Series duct smoke detectors provide early detection of smoke and products of combustion present in air moving through an HVAC duct supply, return, or both in commercial, industrial, and residential applications. These devices are designed to prevent the recirculation of smoke in areas by the air handling system's fans and blowers. Complete systems may be shut down in the event of smoke detection.

⚠ **NOTE:** *For the correct installation of a duct smoke unit, please refer to the NFPA 72 (National Fire Alarm Code), NFPA 90A (Standard for Installation of Air Conditioning and Ventilation Systems), NFPA 92A (Recommended Practice for Smoke Control Systems.), NFPA 5000 (Building Construction and Safety Code), IMC (International Mechanical Code), and IFC (International Fire Code).*

This detector is not intended for open area protection nor should it be used for early warning detection or replace a regular fire detection system.

PRODUCT DESCRIPTION

The SL-2000 Series smoke detector is fitted with a mounting base that will accept an ionization smoke detector head model 55000-225APO or photoelectric smoke detector head model 55000-328APO. The duct unit supports two sets of form "C" alarm contacts, one form "A" alarm contact and one form "C" trouble contact. The trouble contact supervises the presence of the input power, removal of the detector cover and the removal of the smoke detector head.

⚠ **This detector is equipped with a cover removal switch that instantly provides a trouble condition upon removal of the clear cover. For all testing and inspection with the cover removed, the cover removal switch (designated as SW1 on PCB) must be manually depressed to simulate standard "pilot" operation. THE TROUBLE CONTACTS (TERMINALS 4, 15, 5) ARE SHOWN IN THE NON-ENERGIZED CONDITION.**

The trouble contacts **will not** operate in the event of a smoke alarm.
The SL-2000 Series duct detector will operate from various input voltage sources; namely 24VAC, 24VDC, 115VAC and 230VAC.

SAMPLING TUBES

The operating principle of a duct detector is based on the Venturi effect. Two tubes extend into the HVAC duct. Air flowing through the duct is forced into the air intake (inlet) tube via the air intake holes, (facing the airflow) and passes over the detector head. The air will be drawn out via the exhaust tube back into the HVAC duct. (A 7" exhaust tube is provided in the installation kit.) When the concentration of smoke particles suspended in the air stream reach the alarm threshold of the detector head, the unit will go into alarm.

The duct smoke detector units are designed to operate in duct widths from 6" to 10' wide with an air velocity between 100 to 4,000 feet per minute. To verify correct installation, the pressure differential between the sampling (high side) and exhaust (low side) tubes should be measured using a Magnehelic pressure gauge or equivalent. An acceptable reading is between 0.01 and 1.2 inches of water.

To minimize the impact of air turbulence and stratification on performance, a duct smoke detector should be located as far as possible downstream from any obstruction (i.e. deflector plates, elbows, dampers, etc.). In all situations, confirmation of velocity and pressure differential within specifications is required.

REMOTE ACCESSORIES

Audible and visual alarm indicators, remote status indicators, and remote reset/test switches can be accommodated by the SL-2000 Series duct units by connecting to DC voltage output terminals as described on Page 4. These terminals are not supervised and the voltage/current will only be present when the detector unit is in alarm. The remote pilot (green) LED will be permanently illuminated when connected to the output terminals as long as input power and detector head are present.

SL-2000 AT-A-GLANCE

MODEL NUMBER:
SL-2000-N 4-Wire Ionization Duct Smoke Detector
SL-2000-P 4-Wire Photoelectric Duct Smoke Detector

DETECTOR HEAD MODEL NUMBER:
Ionization Detector Head: **55000-225APO**
Photoelectric Detector Head: **55000-328APO**

POWER	*STANDBY CURRENT*	*WITH ACCESSORIES*	*ALARM CURRENT*	*WITH ACCESSORIES*
24VAC	55.0mA	95.0mA	190.0mA	280.0mA
24VDC	14.0mA	32.0mA	68.0mA	165.0mA
115VAC	22.0mA	25.0mA	32.0mA	50mA
230VAC	14.0mA	14.0mA	18.0mA	30.0mA

RELAY CONTACT RATINGS:

Alarm contacts:	2 Sets form "C" rated at 10A @ 115VAC resistive 1 form "A" rated at 2A
Trouble contacts:	1 Set form "C" rated at 10A @ 115VAC resistive
Air velocity:	100 to 4,000ft/min.
Ambient temperature:	SL-2000-N: 32°F to 158°F (0°C to 70°C) SL-2000-P: 32°F to 140°F (0°C to 60°C)
Humidity:	10% to 85% RH Non-Condensing/Non-Freezing
Material:	Gray plastic back box with clear plastic cover (Makrolon 94V-0)
Dimensions:	13½" L X 4½" W X 2¼" D
Max. net wt.:	3½ lbs.
Radioactive element:	SL-2000-N (Ionization) - Americium 241, 0.9 micro curie.

Do not expose to corrosive atmospheres.

U.S. Patents 6,741,181; 7,204,522; 6.124.795

INST APD0194 K140417

MECHANICAL INSTALLATION

LOCATION PREREQUISITES

This guideline contains general information on duct smoke detector installation, but does not preclude the NFPA and/or ICC documents listed. Air Products and Controls assumes no responsibility for improperly installed duct detectors. To determine the correct installation position for an SL-2000 Series duct smoke detector, the following factors must be considered.

1. A uniform non-turbulent (laminar) airflow between 100 ft/min. to 4,000 ft/min. must be present in the HVAC duct. To determine duct velocities, examine the engineering specifications that define the expected velocities or use an Alnor model 6000AP velocity meter (or equivalent).

2. To minimize the impact of air turbulence and stratification on performance, a duct smoke detector should be located as far as possible downstream from any obstruction (i.e. deflector plates, elbows, dampers, etc.). In all situations, confirmation of velocity and pressure differential within specifications is required.

   The pressure differential between the input sampling (high pressure) tube and exhaust (low pressure) tube for the SL-2000 Series smoke duct detector should be greater than 0.01 inches of water and less than 1.2 inches of water.

3. Identify a code compliant location (supply or return side, or both) for the installation of the duct unit that will permit easy access for viewing and serviceability.

4. When installing on the return side, install duct units prior to the air being exhausted from the building or diluted with outside "fresh" air.

5. When installing duct smoke units downstream of filters, fires occurring in the filters will be detected, but if the filters become blocked, insufficient air flow through the duct unit will prevent the correct operation of the duct detector. Duct units installed in the supply air side may monitor upstream equipment and/or filters.

6. Where possible, install duct detectors upstream of air humidifiers and downstream of dehumidifiers.

7. To prevent false alarms, the duct detector should not be mounted in areas of extreme high or low temperatures, in areas where high humidity exists, or in areas where the duct may contain gases or excessive dust.

SAMPLING TUBE ASSEMBLY

The SL-2000 Series duct smoke detectors employ a specially notched sampling tube, which must be ordered separately in one of four standard lengths or packaged as FAST Tubes.

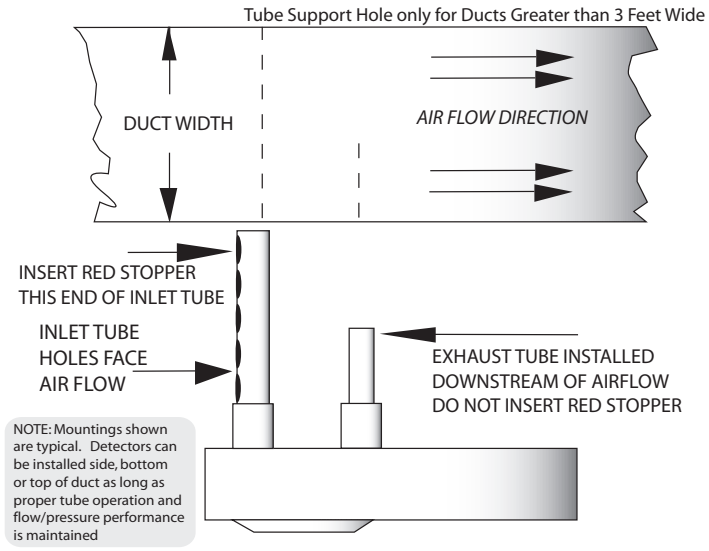
STN-1.0 For duct widths of 6" TO 1.0'
STN-2.5 For duct widths of 1.0' TO 3.0'
STN-5.0 For duct widths of 3.0' TO 5.0'
STN-10.0 For duct widths of 5.0' TO 10.0'
FAST TUBE Sectional tube for duct widths up to 8.0'

Standard sampling tubes are steel tubes with air intake holes drilled the entire length of the tube. FAST Tubes are a recognized plastic with an open slot along the length. These tubes can be cut to length and must span at least 80% of the duct width (spanning the entire width is suggested). Sampling tubes over 3ft must be supported on the opposite side of the duct. To ensure correct operation of the sampling tube, the red end cap (red stopper in installation kit) must be inserted in the end of the air intake. For custom duct widths, always use the next longest standard size and cut down to the exact requirement.

"NO-TOOLS" TUBE INSTALLATION

The SL-2000 Series duct smoke detector provides a unique, patented mechanism for installation and/or removal of the sampling and exhaust tubes from either the front or rear of the detector housing.

Once the airflow direction has been determined, insert the inlet and exhaust tubes into the duct smoke detector. If the cover is in place, the tubes may be inserted into the back of the detector via the key-slots provided. Simply push the tube into place against the spring loaded retainer, and turn into the correct position, allowing the key to "lock" the tube in the desired orientation. For front side installation, simply rotate the tube retainer until the tube may be inserted and oriented properly. Once the tube is installed, rotate the retainer back into place to lock down the tube. Ensure air intake sampling tube is positioned so that the inlet holes (or FAST Tube slot) are directly facing the airflow.



DUCT PREPARATION

Remove mounting template from the installation kit. Remove paper backing from the mounting template and affix it to the duct at the desired location. Using the template as a guide, drill (2) mounting holes, 3/32" (2.5mm) for the #12 X " sheet metal screws packaged in the installation kit. Drill or punch (2) 1 " (32mm) holes for inlet sampling and exhaust tubes, using the template as a guide. Clean all holes.

MOUNTING

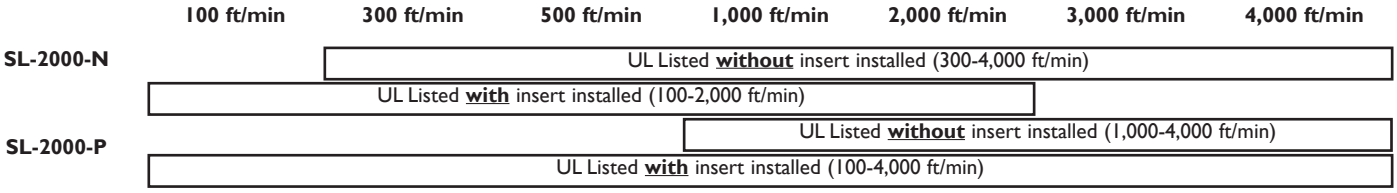
After securing the sampling and exhaust tubes to the duct smoke unit, (or initially placing the tubes through the 1 " holes drilled or punched in the HVAC duct to accept the inlet sampling and exhaust tubes and then attaching them to the duct unit), hold the duct unit assembly in position and use (2) # 12 X " sheet metal screws (packaged in the installation kit) to secure the duct smoke detector to the HVAC duct sheet metal.

AIR SAMPLING VERIFICATION

To ensure correct operation of the duct unit use a Magnehelic differential pressure gauge, Dwyer 2000 or 4000 Series (or equivalent) to determine the differential pressure between the inlet (high side) and exhaust (low side) tubes. The differential pressure between the two tubes should be greater than 0.01 inches of water and less than 1.2 inches of water.

AIR SAMPLING VERIFICATION (CONT'D)

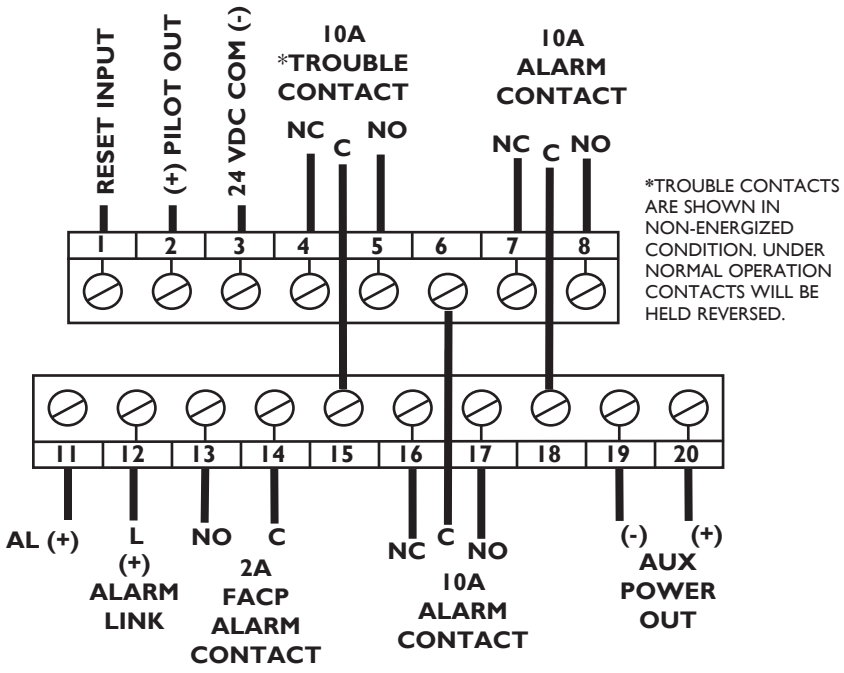
This duct smoke detector is shipped with a velocity adapter insert, either factory installed (SL-2000-P), or found in the installation kit (SL-2000-N). When installed, this adapter will allow the duct detector to operate at extremely low air velocities. To install the adapter, simply insert it into the slots provided inside the detector housing so that the adapter fits snugly over the smoke detector head. Unless your system is consistently operating in the slower velocity range (where the adapter is specifically required, SL-2000-N), we recommend that the adapter not be inserted. If you experience false alarms at higher velocities with the adapter in place, the adapter should be removed. Please use the following chart for guidance on when the velocity adapter should be used. For reference, the speeds indicated are intended to represent the velocity of air within the duct under normal operational conditions.

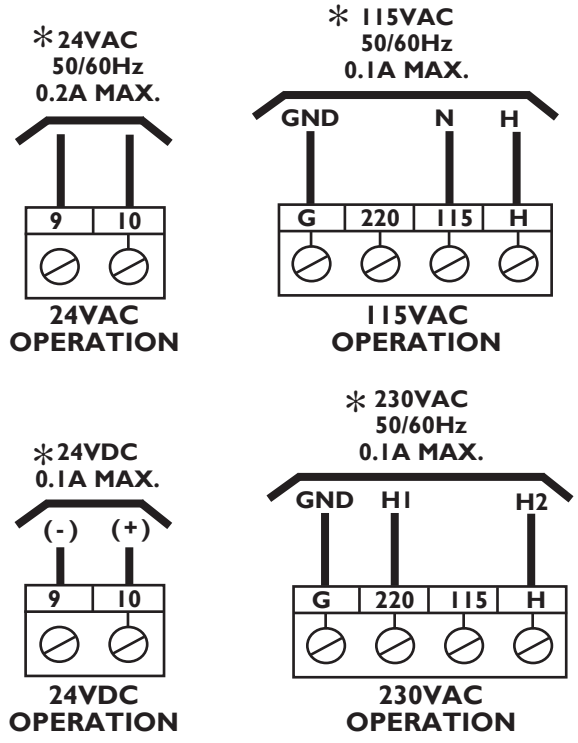


ELECTRICAL INSTALLATION

TERMINAL AND POWER CONNECTIONS

Prior to connecting input power to the duct unit, determine the correct input voltage/ current availability and ensure it is connected to the correct terminals.





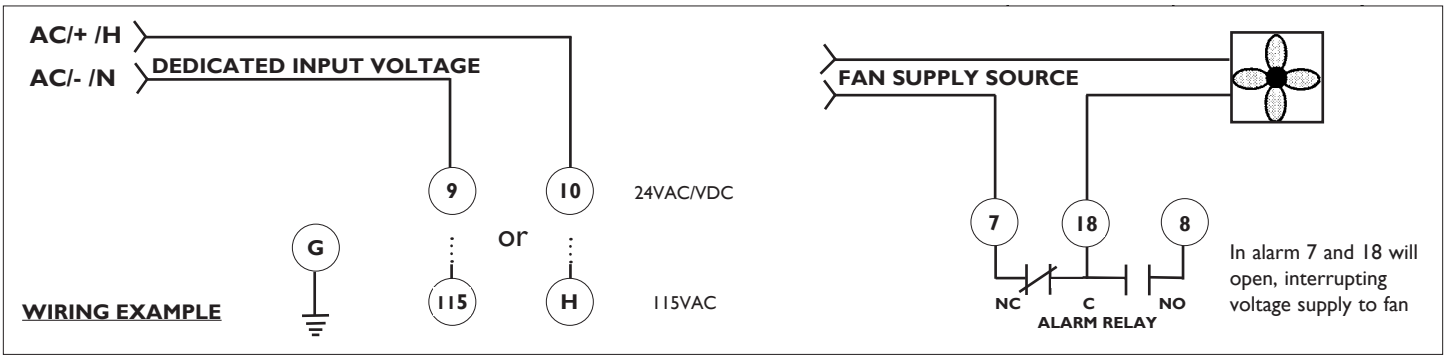
* NOTE: Choose only one source of operating voltage

WIRING

⚠ **CAUTION**: Do not use looped wire under terminals. Break wire run to provide for proper supervision of connections.
MISE EN GARDE: Ne pas enrouler le fil sous les bornes. Pour assurer la supervision electrique des raccordements, il faut couper les fils.

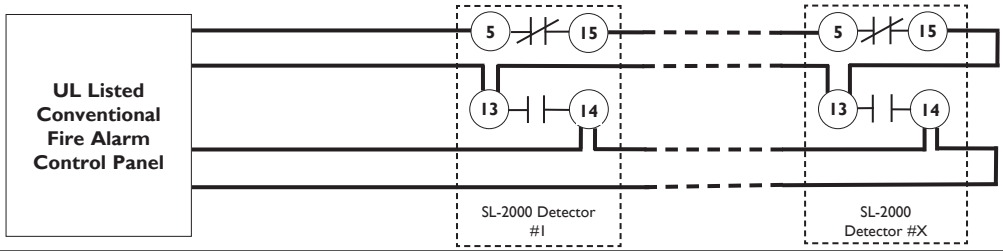
With detector head removed, connect one of the appropriate dedicated power sources to the applicable terminals (see above). Replace detector head and depress the cover removal switch (SW1) and the unit will be energized. The green pilot LED will be illuminated, and when pressing the test/reset button (SW2), the red alarm LED will be illuminated. This test confirms the correct basic operation of the duct smoke unit, excluding the detector head (see functional testing).

In the event of a fire alarm, certain equipment may be required to be shut down. For example, shut down may be achieved by interrupting the fan supply source to that particular piece of equipment when wired as indicated on Page 4.

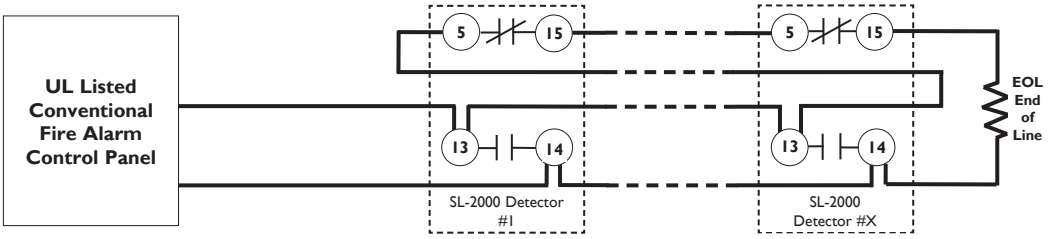


FIRE ALARM CONTROL PANEL WIRING

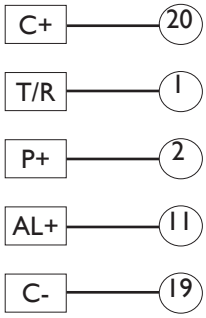
SAMPLE CONTROL PANEL WIRING - STYLE "D" / CLASS "A" IDC (Supervised - A fault condition will not inhibit an alarm response)



SAMPLE CONTROL PANEL WIRING - STYLE "B" / CLASS "B" IDC (Supervised - A fault condition will not inhibit an alarm response)



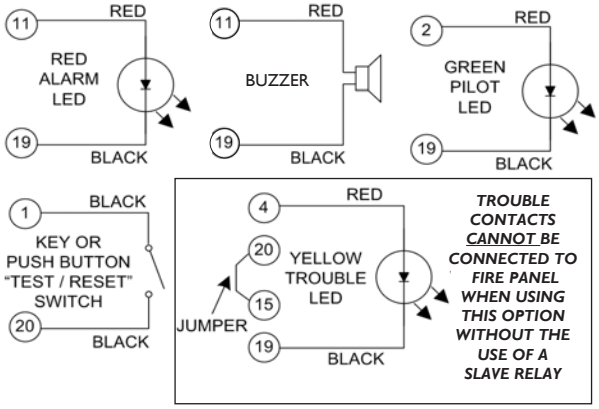
MSR REMOTE ACCESSORY WIRING



CONNECTIONS SHOWN FOR ALL POSSIBLE TERMINAL STYLE CONFIGURATIONS.

CONNECT ONLY THOSE TERMINALS AVAILABLE ON THE MSR REMOTE ACCESSORY CONTROL ASSEMBLY.

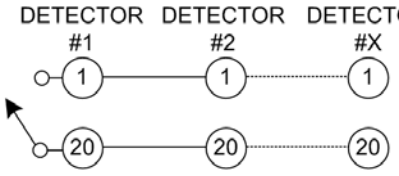
MS REMOTE ACCESSORY WIRING



INTERCONNECTION WIRING FOR COMMON FUNCTIONS

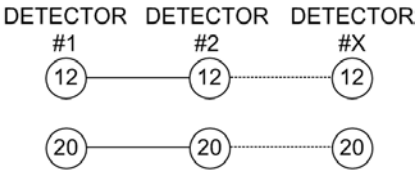
* **NOTE:** A common power supply must be used for all interconnected detectors.

Common Test/Reset



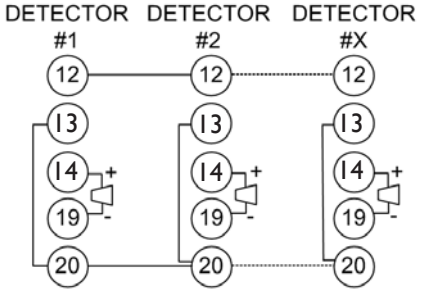
30 detectors max.
(Use normally open test/reset switch)

Common Alarm Shutdown



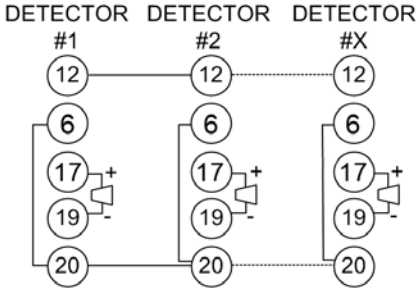
All alarm relays operate with single alarm. 30 detectors max.

Adding Individual Horn/Strobes



All alarm relays operate with single alarm. Individual horn/strobe units operate on alarmed detector only. 30 detectors max.

Adding Common Alarm Horn/Strobes



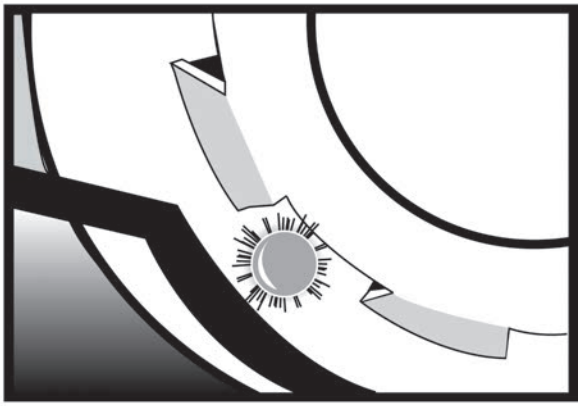
All alarm relays operate with single alarm. All horn/strobe units operate on any single alarm. 30 detectors max.

TESTING AND MAINTENANCE PROCEDURES

OPERATIONAL TESTING

To determine the correct operation of the SL-2000 Series duct smoke detector, ensure input power is connected and the green pilot LED is illuminated.

The LED on the detector head of both the ionization and photoelectric models will flash while the unit is in standby mode. The LED on the smoke detector head will be permanently illuminated when smoke is detected and the head is in alarm.



Above: The LED will be permanently illuminated when the unit is in alarm.

With the air handling unit shut down (not connected), and the clear cover removed, press and hold the test/reset button and the cover removal switch on the SL-2000. The red alarm LED on the circuit board will be illuminated and the alarm relay outputs will change state. Using a multimeter set to OHMS (or continuity buzzer function on the meter) place the meter probes on the following terminals, and ensure the contacts are closed (continuity) (8-18) and (6-17). When releasing the test/reset button these contacts will open.

The trouble contacts (4,15,5) on the SL-2000 detector will not change state in the event of a fire alarm, operational, or functional testing. The trouble contacts can be tested by either releasing the cover removal switch, or depressing the cover removal switch after rotating the smoke detector head counter-clockwise and removing the detector head. This action will extinguish the green pilot LED and cause the trouble contacts to change state, (4-15) will be closed (continuity) and (5-15) will be open circuit. Replacing the detector head and rotating it clockwise until it locks, will cause the green pilot LED to be illuminated and the unit will be operational, terminals (4-15) will be an open circuit and (5-15) will be closed (continuity).

FUNCTIONAL TESTING

Once operational testing is concluded the unit requires functional testing to determine the correct operation of the detector head.

MAGNET TESTING: Place the magnet provided with the installation kit on top of the housing between the raised sections above the detector head (as indicated by the arrows on the unit cover). Allow at least five seconds for alarm initiation. Remove magnet and reset detector.

SMOKE TESTING: Using smoke test canister with testing nozzle (available from Air Products and Controls Inc. part number TG-2000), insert the test gas nozzle into the test port on the unit cover. Press can against cover to release gas into the chamber.

⚠ CAUTION: DO NOT SPRAY GAS FOR MORE THAN ½ SECOND. TEST GAS FACILITY MAY RESULT IN DETECTOR CONTAMINATION.

⚠ MISE EN GARDE: NE VAPORISEZ PAS DE GAZ POUR PLUS DE ½ SECONDE. SURUTILISATION DES GAZ DE TEST INSTALLATION PEUT ENTRAÎNER LA CONTAMINATION DU DÉTECTEUR.

After 15 to 20 seconds the detector head will go into alarm, illuminating the detector head LED and causing the duct unit functions to operate, alarm relays will change state, and the alarm related remote accessories, if attached, will function.

If no test gas is available to conduct functional testing, remove cover and, while holding down the cover removal switch, blow smoke from a cotton wick or punk directly at the head to cause an alarm. The alarm indicator should illuminate within one minute.

Should additional testing also be required for simulated fire conditions, smoke bombs placed in the duct may not be suited for the particular detector head (photoelectric or ionization) selected and installed. Consult the smoke bomb data for proper use and compatibility with detector type.

The S65A ionization detector head (55000-225APO) utilizes a radioactive source as its means of detection and will detect smoke particles of between .1 and 1 micron in size.

The S65A photoelectric detector head (55000-328APO) operates on the principle of light scatter and will detect smoke particles of between 1 and 10 microns in size.

When purchasing smoke bombs for additional required functional testing, ensure smoke particle sizes comply with the criteria as described above.

NOTE: In situations that require a duct smoke detector to be held in an alarm condition for an extended period of time, the magnet test or smoke test methods should be used to ensure the detector is locked into alarm.

MAINTENANCE

Each installation location must be assessed on its own merits. If the protected area is of a very dirty nature then the SL-2000 Duct unit(s) will have to be checked and cleaned on a quarterly basis or when cleaning is required.

As a guideline the smoke detector head should be cleaned every six months or as required. The best methods of cleaning are to vacuum the detector head thoroughly or to blow the detector head out using clean, dry compressed air.

Do not use chemicals or non-conforming air to clean the detector head housing as this could contaminate the detector head and damage the casing.

Sensing tubes must be inspected and cleaned in accordance with the schedule as determined above, to allow the free flow of air through both inlet and exhaust tubes.

Consult your local code and AHJ requirements for required maintenance schedules.

AIR PRODUCTS AND CONTROLS INC.
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AVAILABLE ACCESSORIES FOR USE WITH SL-2000 SERIES DUCT SMOKE DETECTORS

MSR- SERIES REMOTE ACCESSORIES

MSR-100R Series Features Visual Indicators: Alarm, Pilot, Trouble • Buzzer: Programmable for Alarm and Trouble Buzzer Silence: Visual Notification and Ringback • Detector Test/Reset: Key Operated • LED/Buzzer Test: Push-Button Operated

MSR-50RM Series Features Magnet Test, Pushbutton Reset, Visual Pilot, Trouble, Alarm LED
MSR-50RK Series Feature Key Test & Reset with Visual Pilot, Trouble, Alarm LED
MSR-AV Series Features plug-in combination Strobe (Visual) and Sounder (AMSR-50SA ***Series*** Features plug-in combination Strobe (Visual) and Sounder (Audible)

MS-SERIES REMOTE ACCESSORIES

MS-RA Remote Alarm
MS-RA/R Alarm, push button Test/Reset Switch
MS-RA/P/R Remote Alarm, Pilot, push-button Test/Reset Switch
MS-KA/R Remote Alarm, key-operated Test/Switch
MS-KA/P/R Remote Alarm, Pilot, key-operated Test/Reset Switch
MS-RA/P Remote Alarm, Pilot
MS-RH Remote Alarm Horn
MS-RH/KA/P/R Remote Alarm, Pilot, Horn, key-operated Test/Reset Switch
MS-RH/P/A Remote Alarm, Pilot, Horn
MS-RH/KA/P/A/T Remote Alarm, Trouble, Pilot, Horn, key-operated Test/Reset Switch
MS-RA/P/T Remote Pilot, Trouble
MS-RA/FT/P Remote Pilot, Trouble, push-button Test/Reset Switch
MS-KA/P/R/T Remote Pilot, Trouble, key-operated Test/Reset Switch
MS-RD Remote Alarm
MS-F/T Remote Trouble

SMOKE TEST GAS

TG-2000 Solo Aerosol Test Gas with Nozzle for Test Port

SAMPLING TUBES

STN-1.0 For duct widths of 6" to 1.0'
STN-2.5 For duct widths of 1.0' to 3.0'
STN-5.0 For duct widths of 3.0' to 5.0'
STN-10.0 For duct widths of 5.0' to 10.0'
FAST Tube Sectional Tube for Duct Widths up to 8ft

REPLACEMENT SMOKE DETECTOR HEADS

55000-225APO	S65A Ionization Detector Replacement Head
55000-328APO	S65A Photoelectric Detector Replacement Head

POWER SUPPLIES

T-PB 202-1	24VAC @ 4.0A Class I Power Supply
T-PB 202-0	24VAC @ 4.0A Class I Power Supply
T-PB 303-1	24VAC @ 3.0A Class II Power Supply
T-PB 303-0	24VAC @ 3.0A Class II Power Supply

SL-2000 SERIES
DUCT SMOKE DETECTORS

INSTALLATION AND MAINTENANCE INSTRUCTIONS

SL-2000-N Ionization Type, 4-Wire Duct Smoke Detector
SL-2000-P Photoelectric Type, 4-Wire Duct Smoke Detector

SIGNALING c UL us LISTED

ANSI APPROVED / UL LISTED to the 268A Standard for Smoke Detectors for Duct Application: UROX, UROX7, File No S2829

CSFM LISTED: 3240-1004:105 • MEA ACCEPTED: 73-92-E VOL 27

A COPY OF THESE INSTRUCTIONS SHOULD BE LEFT WITH THE EQUIPMENT UNTIL INSTALLATION BY ALL TRADES IS FULLY COMPLETE. FOLLOWING FINAL INSPECTION, A COPY SHOULD BE LEFT WITH THE OWNER/USER.

FOR TECHNICAL SUPPORT CALL 888-332-2241 OR 248-332-3900